PHY2191: ELECTRICITY AND MAGNETISM

Effective Term
Semester A 2022/23

Part I Course Overview

Course Title
Electricity and Magnetism

Subject Code
PHY - Physics
Course Number
2191

Academic Unit
Physics (PHY)

College/School
College of Science (SI)

Course Duration
One Semester

Credit Units
3

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

Medium of Instruction
English

Medium of Assessment
English

Prerequisites
AP1202/PHY1202 General Physics II or equivalent
MA1200 Calculus and Basic Linear Algebra I or equivalent
MA1201 Calculus and Basic Linear Algebra II or equivalent

Precursors
PHY1101 Introductory Classical Mechanics or
AP1201/PHY1201 General Physics I or equivalent

Equivalent Courses
AP2191 Electricity and Magnetism

Exclusive Courses
Nil

Part II Course Details

Abstract

This is an introductory course aims at covering the basic principles of electricity and magnetism and their applications. The course is designed to provide students with a working knowledge of the elementary physics principles of electric charges and fields, Gauss’ s law, electric potential, magnetic field, induction and Lorentz force. 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 a wide range of both hypothetical and practical scientific problems.

Course Intended Learning Outcomes (CILOs)

	CILOs	Weighting (if app.)	DEC-A1	DEC-A2	DEC-A3
1	Analyse and solve problems involving a system of static point electric charges			x	
2	Apply the concept of electric fields and electric potential in problem solving		x	x	
3	Apply Gauss’ s law to solve problems with high symmetry in electrostatics			x	
4	Analyse and solve problems involving capacitors and simple electric circuits			x	x
5	Describe the dynamics of charged particles under Lorentz force		x	x	
6	Analyse and solve problems involving magnetic fields generated by static currents			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	Lectures	Explain key concepts, provide examples of electricity and magnetism	1, 2, 3, 4, 5, 6	2 hrs/wk
2	Tutorials/Student Centred Activities	Help students to practice what they learn in the lectures by holding discussions and solving problems	1, 2, 3, 4, 5, 6	1 hr/wk

3	Laboratory Work	Hands-on demonstration of principle taught in classes	1, 2, 3, 4, 5, 6	1 hr/wk

Assessment Tasks / Activities (ATs)

	ATs	CILO No.	Weighting (%)	Remarks (e.g. Parameter for GenAI use)
1	Assignments	1, 2, 3, 4, 5, 6	15	
2	Test	1, 2, 3, 4, 5, 6	10	
3	Laboratory	1, 2, 3, 4, 5, 6	25	

Continuous Assessment (%)

50

Examination (%)

50

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. Assignments

Criterion

Capable to show a good understanding of the taught materials from solving the given problems.

Excellent (A+, A, A-)

High

Good (B+, B, B-)

Significant

Fair (C+, C, C-)

Moderate

Marginal (D)

Basic

Failure (F)

Not given enough efforts or unable to grasp the basic concept.

Assessment Task

2. Test

Criterion

Ability to solve common electricity and magnetism problems.

Excellent (A+, A, A-)
High

Good (B+, B, B-)
Significant

Fair (C+, C, C-)
Moderate

Marginal (D)
Basic

Failure (F)
Not given enough efforts or unable to grasp the basic concept.

Assessment Task
3. Laboratory

Criterion
Ability to operate the laboratory instrument, and understand the demonstrated principles.

Excellent (A+, A, A-)
High

Good (B+, B, B-)
Significant

Fair (C+, C, C-)
Moderate

Marginal (D)
Basic

Failure (F)
Not given enough efforts or unable to grasp the basic concept.

Assessment Task
4. Examination

Criterion
Ability to grasp the concept of the taught materials and to solve common electricity and magnetism problems.

Excellent (A+, A, A-)
High

Good (B+, B, B-)
Significant

Fair (C+, C, C-)
Moderate

Marginal (D)

Basic

Failure (F)

Not given enough efforts or unable to grasp the basic concept.

Part III Other Information

Keyword Syllabus

Vector analysis
Electric charge
Electric fields
Gauss' law
Electric potential
Capacitance
Electric fields in matter
Current and resistance
Lorentz force
Magnetic fields
Magnetic vector potential
Magnetic fields in matter
Induction

Reading List

Compulsory Readings

	Title
1	David J. Griffiths, "Introduction to Electrodynamics" 4th Edition, Cambridge University Press (2017).

Additional Readings

	Title
1	D Halliday, R Resnick, and J Walker, "Fundamentals of Physics" 9th Edition, Wiley (2011).
2	Edward M. Purcell and David J. Morin, "Electricity and Magnetism" 3rd Edition, Cambridge University Press (2013)