

PHY2191: ELECTRICITY AND MAGNETISM

Effective Term

Semester A 2024/25

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 DEC-A1 DEC-A2 DEC-A3 app.)		
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.

Learning and Teaching Activities (LTAs)

	LTAs	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
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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

Able to correctly answer nearly all assignment questions.

Good (B+, B, B-)

Significant

Able to correctly answer most assignment questions.

Fair (C+, C, C-)

Moderate

Able to correctly answer some assignment questions.

Marginal (D)

Basic

Able to correctly answer a few assignment questions.

Failure (F)

Not even reaching marginal level

Unable to correctly answer even a few assignment questions.

Assessment Task

2. Test

Criterion

Ability to solve common electricity and magnetism problems.

Excellent (A+, A, A-)

High

Able to correctly answer nearly all test questions.

Good (B+, B, B-)

Significant

Able to correctly answer most test questions.

Fair (C+, C, C-)

Moderate

Able to correctly answer some test questions.

Marginal (D)

Basic

Able to correctly answer a few test questions.

Failure (F)

Not even reaching marginal level

Unable to correctly answer even a few test questions.

Assessment Task

3. Laboratory

Criterion

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

Excellent (A+, A, A-)

High

Able to correctly perform nearly all experiment procedures and explain nearly all principles.

Good (B+, B, B-)

Significant

Able to correctly perform most experiment procedures and explain most principles.

Fair (C+, C, C-)

Moderate

Able to correctly perform some experiment procedures and explain some principles.

Marginal (D)

Basic

Able to correctly perform a few experiment procedures and explain a few principles.

Failure (F)

Not even reaching marginal level

Unable to correctly perform even a few experiment procedures; Unable to explain even a few principles.

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

Able to correctly answer nearly all examination questions.

Good (B+, B, B-)

Significant

Able to correctly answer most examination questions.

Fair (C+, C, C-)

Moderate

Able to correctly answer some examination questions.

Marginal (D)

Basic

Able to correctly answer a few examination questions.

Failure (F)

Not even reaching marginal level

Unable to correctly answer even a few examination questions.

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

Reading List**Additional Readings**

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