



# Course Specification

## (Bachelor)

**Course Title:** Electricity and Magnetism 2

**Course Code:** PHYS 0222

**Program:** BSc in Physics and BSc in Physics of Renewable Energy and Environment

**Department:** Physics

**College:** Science

**Institution:** Majmaah University

**Version:** 1

**Last Revision Date:** 29 December 2024



## Table of Contents

<b>A. General information about the course:</b> .....	3
<b>B. Course Learning Outcomes (CLOs), Teaching Strategies and Assessment Methods</b> .....	5
<b>C. Course Content</b> .....	7
<b>D. Students Assessment Activities</b> .....	7
<b>E. Learning Resources and Facilities</b> .....	8
<b>F. Assessment of Course Quality</b> .....	8
<b>G. Specification Approval</b> .....	9



## A. General information about the course:

### 1. Course Identification

1. Credit hours: 4 (3,2,0)

#### 2. Course type

A.  University  College  Department  Track  Others  
 B.  Required  Elective

3. Level/year at which this course is offered: (Level 3 / second year)

#### 4. Course General Description:

This course is based on what was studied in the Electricity and Magnetism 1 PHYS 0121 course

**Theoretical part:** Direct-Current Circuits (Electromotive Force- Advanced Series - Parallel combination of resistors -Kirchhoff's Rules- Electrical Measuring Instruments- RC Circuits)- Sources of Magnetic Fields(The Biot-Savart Law- Magnetic Field Due to a Thin Straight Wire-Magnetic Force between Two Parallel Currents- Magnetic Field of a Current Loop-Ampère's Law- Solenoids and Toroid's Magnetism in Matter) - Electromagnetic Induction( Faraday's Law-Lenz's Law- Motional Emf- Induced Electric Fields- Eddy Currents- Electric Generators and Back Emf-Applications of Electromagnetic Induction) – Inductance(Mutual Inductance-Self-Inductance and Inductors-Energy in a Magnetic Field-RL Circuits-Oscillations in an LC Circuit- RLC Series Circuits) - Alternating-Current Circuits (AC Sources- Simple AC Circuits -RLC Series Circuits with AC-Power in an AC Circuit-Resonance in an AC Circuit-Transformers).

**Practical part:** are designed to cover the following concepts: Advanced Series-Parallel combination of resistors Experiment - Kirchhoff's Laws Experiment, Biot - Savart law, Faraday's law, Magnetic Force versus Current Experiment, e/m of the electron, Magnetic induction, transformers, generators, motors, RCL circuits

#### 5. Pre-requirements for this course (if any):

PHYS 0121 Electricity and Magnetism 1

#### 6. Co-requisites for this course (if any):

None

#### 7. Course Main Objective(s):



- 1- Develop students' abilities to understand all phenomena of electricity and magnetism and use them to explain electric instruments work and establish a scientific basic background to understand the subsequent courses.
- 2- students identify the relation between electricity and magnetism by solving the physical problems
- 3- Demonstrate an understanding of the magnetic field for steady currents and moving charges.
- 4- Investigate the behavior of the basic physical phenomena of electricity & Magnetism in laboratory experiments.

## 2. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	75	100%
2	E-learning		
3	Hybrid <ul style="list-style-type: none"> <li>• Traditional classroom</li> <li>• E-learning</li> </ul>		
4	Distance learning		

## 3. Contact Hours (based on the academic semester)

No	Activity	Contact Hours
1.	Lectures	45
2.	Laboratory/Studio	30
3.	Field	
4.	Tutorial	
5.	Others (specify)	
<b>Total</b>		<b>75</b>



## B. Course Learning Outcomes (CLOs), Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Code of PLOs aligned with the program	Teaching Strategies	Assessment Methods
<b>1.0</b>	<b>Knowledge and understanding</b>			
1.1	Knowledge of methods for calculating and measuring electric and magnetic fields and the mathematical theories that deal with them, as well as knowledge of some applications of electric and magnetic fields.	K1	Direct teaching: Lectures Presentations discussions Indirect teaching: Peer Learning	Quiz Assignment Mid term exams Final exams
1.2	Abilities to understand all phenomena of electricity and magnetism and use them to explain electric instruments work and establish a scientific basic background to understand the subsequent courses.	K1	Direct teaching: Lectures Presentations discussions Indirect teaching: Peer Learning	Quiz Assignment Mid term exams Final exams
1.3	Know the AC Sources- Simple AC Circuits -RLC Series Circuits with AC-Power in an AC Circuit-Resonance in an AC Circuit-Transformers	K2	Direct teaching: Lectures Presentations discussions Indirect teaching: Peer Learning	Quiz Assignment Mid term exams Final exams
<b>2.0</b>	<b>Skills</b>			
2.1	skill to solving	S1	Oral quizzes Class	Exams





Code	Course Learning Outcomes	Code of PLOs aligned with the program	Teaching Strategies	Assessment Methods
	physical problems that identify the relationship between electricity and magnetism		discussion Class Activity	Homework Assignments Presentations
2.2	Distinguish between Mutual Inductance-Self-Inductance and Inductors-Energy in a Magnetic Field-RL Circuits- Oscillations in an LC Circuit- RLC Series Circuits	S1	Oral quizzes Class discussion Class Activity	Exams Homework Assignments Presentations
2.3	Calculate Motional Emf- Induced Electric Fields- Eddy Currents	S2	Oral quizzes Class discussion Class Activity	Exams Homework Assignments Presentations
<b>3.0</b>	<b>Values, autonomy, and responsibility</b>			
3.1	<ul style="list-style-type: none"> <li>Learn how to search for information through library and internet.</li> </ul>	V1	Direct teaching: Lectures Presentations discussions Indirect teaching: Peer Learning	Quiz Assignment Mid term exams Final exams
3.2	<ul style="list-style-type: none"> <li>Present a short report in a written form and orally using appropriate scientific language</li> </ul>	V2	Direct teaching: Lectures Presentations discussions Indirect teaching: Peer Learning	Quiz Assignment Mid term exams Final exams
3.3	<ul style="list-style-type: none"> <li>Operate questions and communicate with teacher through solve problems and work in groups</li> </ul>	V2	Direct teaching: Lectures Presentations discussions Indirect teaching: Peer Learning	Quiz Assignment Mid term exams Final exams





### C. Course Content

No	List of Topics	Contact Hours
1.	Direct-Current Circuits (Electromotive Force- Kirchhoff's Rules- Advanced Series-Parallel combination of resistors Electrical Measuring Instruments- RC Circuits)	9
2.	Sources of Magnetic Fields	9
3.	(The Biot-Savart Law-Magnetic Field Due to a Thin Straight Wire-Magnetic Force between Two Parallel Currents- Magnetic Field of a Current Loop- Ampère's Law- Solenoids and Toroid's- Magnetism in Matter)	9
4.	Electromagnetic Induction (Faraday's Law-Lenz's Law-Motional Emf- Induced Electric Fields- Eddy Currents- Electric Generators and Back Emf-Applications of Electromagnetic Induction)	8
5.	Inductance (Mutual Inductance-Self-Inductance and Inductors-Energy in a Magnetic Field-RL Circuits- Oscillations in an LC Circuit- RLC Series Circuits)	6
6.	Advanced Series-Parallel combination of resistors	2
7.	Kirchhoff's Laws Experiment Part	2
8.	Measuring the force acting on current carrying conductors in a homogenous magnetic field	2
9.	Measuring the magnetic field of an air coil, and straight conductor.	4
10.	Voltage transformation using a transformer without load.	2
11.	Voltage transformation using a transformer with load.	2
12.	Effect of magnetic field on electron deflection	2
13.	Effect of current on electron deflection	2
14.	Measuring the induction voltage of a conductor loop in a variable magnetic field.	4
15.	Helmholtz experiment.	2
16.	Verification of Biot-Savart law.	2
17.	Revision	2
18.	Final exam	2
19.	Advanced Series-Parallel combination of resistors	2
20.	Kirchhoff's Laws Experiment Part	2
<b>Total</b>		<b>75</b>

### D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	First exam	6th	15%
2.	Second exam	12th	15%





No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
3.	Lab. Exam	12th	20%
4.	Homework	Every week	5%
5	Quiz	8th	5%
6	Final exam	End of the semester	40%

\*Assessment Activities (i.e., Written test, oral test, oral presentation, group project, essay, etc.).

## E. Learning Resources and Facilities

### 1. References and Learning Resources

<b>Essential References</b>	Introduction to Electricity, Magnetism, Circuits, Daryl Janzen University of Saskatchewan, 2018.
<b>Supportive References</b>	Raymond, A. Serway, J., & John W. J. Physics for Scientists and Engineers. (2019) 10th Edition
<b>Electronic Materials</b>	
<b>Other Learning Materials</b>	

### 2. Required Facilities and equipment

Items	Resources
<b>facilities</b> (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	Classrooms, Physics Laboratory and computer with internet lab.
<b>Technology equipment</b> (projector, smart board, software)	Computer Lab. and internet lab, data show, Smart Board.
<b>Other equipment</b> (depending on the nature of the specialty)	Library with text book for search and revision, Wi-Fi internet connections

## F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	Internal Reviewer committee	Direct
Effectiveness of Students assessment	Student Self-Assessment and Peer Assessment.	Indirect
Quality of learning resources	Peer Reviewer	Direct
The extent to which CLOs have been achieved	Internal Reviewer committee	Direct



Assessment Areas/Issues	Assessor	Assessment Methods
Other	Internal Reviewer committee	Direct

**Assessors** (Students, Faculty, Program Leaders, Peer Reviewers, Others (specify))

**Assessment Methods** (Direct, Indirect)

### G. Specification Approval

<b>COUNCIL /COMMITTEE</b>	<b>DEPARTMENT COUNCIL</b>
<b>REFERENCE NO.</b>	<b>16</b>
<b>DATE</b>	<b>30-12-2024</b>

