Course Specification
(Bachelor)

Course Title:	Electricity and Magnetism 1
Course Code:	PHYS 0121
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

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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: (1st level/ 1 year)					
4. Course General Description:					

This course is an introduction to electricity and magnetism and their mathematical description. Topics include:
Theoretical part: Electric Charge, Insulators and conductors, Coulomb's law, Point charge, The electric field, Electric field of multiple point charges, The electric field of continuous charge distribution, examples of various shapes, The parallel plate capacitor, Electric dipole, motion of point charge and electric dipole in electric field, Electric flux, Gauss's law, Applications of Gauss's law, Conductor in electrostatic equilibrium, The electric current, current density, Conductivity, Electric potential, The potential of point charges, The potential of dipole, The electric potential of many charges, Capacitance and capacitors, Energy stored in a capacitor, Fundamental circuits, Ohm's law, Magnetism and magnetic force, source of magnetic fields, Magnetic field of a current, Magnetic dipoles ,The magnetic force on a moving charge, The magnetic force on a current-carrying wire, Magnetic Force on a Current-Carrying Conductor, Force and Torque on a Current Loop, Applications of Magnetic Forces and Fields.
Practical part: Verification of Ohm's Law, Metric bridge, Charge and discharge of capacitors, Series connection of capacitors, Parallel connection of capacitors.

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

None

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

None

7. Course Main Objective(s):

Know Fundamental laws and concepts in electricity and magnetism.
Studying principles of electricity.
Studying principles of magnetism.

2. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	75	100%
2	E-learning		
3	Hybrid • Traditional classroom • E-learning		
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)**	
Total		75

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
1.0	**Knowledge and understanding**			
1.1	know the basic laws of electricity.	K1	Direct teaching: Lectures Presentations discussions Indirect teaching: Peer Learning	Quiz Assignment Midterm exams Final exams
1.2	know the potential differences and fields of a point charge and	K1	Direct teaching: Lectures Presentations	Quiz Assignment Midterm

Code	Course Learning Outcomes	Code of PLOs aligned with the program	Teaching Strategies	Assessment Methods
	conductors.		discussions Indirect teaching: Peer Learning	exams Final exams
1.3	Know the magnitude of magnetic fields and forces.	K2	Direct teaching: Lectures Presentations discussions Indirect teaching: Peer Learning	Quiz Assignment Midterm exams Final exams
2.0	**Skills**			
2.1	apply Gauss's law to various Charge Distributions	S1	Oral quizzes Class discussion Class Activity	Exams Homework Assignments Presentations
2.2	Distinguish between Parallel and Series combinations of Capacitors	**S1**	Oral quizzes Class discussion Class Activity	Exams Homework Assignments Presentations
2.3	Calculate magnetic fields and forces in conductors.	**S2**	Oral quizzes Class discussion Class Activity	Exams Homework Assignments Presentations
3.0	**Values, autonomy, and responsibility**			
3.1	• Learn how to search for information through the library and the internet.	V1	Direct teaching: Lectures Presentations discussions Indirect teaching: Peer Learning	Quiz Assignment Midterm exams Final exams
3.2	• Present a short report in a written form and orally using appropriate scientific language	**V2**	Direct teaching: Lectures Presentations discussions Indirect teaching: Peer Learning	Quiz Assignment Midterm exams Final exams
3.3	•Operate questions and communicate with teacher through solve problems and	**V2**	Direct teaching: Lectures Presentations discussions	Quiz Assignment Midterm exams

Code	Course Learning Outcomes	Code of PLOs aligned with the program	Teaching Strategies	Assessment Methods
	work in groups		Indirect teaching: Peer Learning	Final exams

C. Course Content

No	List of Topics	Contact Hours
1.	Chapter 1: Electric Charge, Conductors, Insulators, and Charging by Induction, Coulomb's Law, Electric Field, Calculating Electric Fields of Charge Distributions, Electric Field Lines, Electric Dipole.	6
2.	Chapter 2: Electric Flux, Explaining Gauss's Law, Applying Gauss's Law, Conductors in Electrostatic Equilibrium	9
3.	Chapter 3: Electric Potential Energy, Electric Potential and Potential Difference, Calculations of Electric Potential, Determining Field from Potential, Equipotential Surfaces and Conductors, Applications of Electrostatics.	9
4.	Chapter 4: Capacitors and Capacitance, Capacitors in Series and in Parallel, Energy Stored in a Capacitor, Capacitor with a Dielectric	6
5.	Chapter 5: Electrical Current, Model of Conduction in Metals, Resistivity and Resistance, Ohm's Law, Resistors in Series and in Parallel, Electrical Energy and Power	6
6.	Chapter 6: Magnetism and Its Historical Discoveries, Magnetic Fields and Lines, Motion of a Charged Particle in a Magnetic Field, Magnetic Force on a Current-Carrying Conductor, Force and Torque on a Current Loop, The Hall Effect, Applications of Magnetic Forces and Fields	9
7.	LAB: Measurements tools and instruments	2
8.	LAB: Lecture on Safety and hazards	2
9.	LAB: Investigating the charge distribution on the surface of electrical conductors	2
10.	LAB: Confirming Coulomb's law	2
11.	LAB: Determining the capacitance of a plate capacitor	2
12.	LAB: Verifying Ohm's law and measuring specific resistances	2
13.	LAB: Verifying Ohm's law with two parallel resistors	2
14.	LAB: Verifying Ohm's law with two series resistors	2
15.	LAB: Correlation between resistance and length of a wire Set-up with the apparatus for resistance measurements	2
16.	LAB: Correlation between resistance and the cross-sectional area of a wire Set-up with the apparatus for resistance measurements	2
17.	LAB: Correlation between the resistance and the material of a wire Set-up with the apparatus for resistance measurements	2
18.	LAB: Metric bridge.	2

19.	LAB: Series connection of capacitors	2
20	LAB: Parallel connection of capacitors	2
21.	LAB: Charge and discharge of capacitors	2
Total		**75**

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%
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

Essential References	Introduction to Electricity, Magnetism, Circuits, Daryl Janzen University of Saskatchewan, 2018.
Supportive References	Electricity and Magnetims, Edward M. Purcell. Cambridge University Press, 2013.
Electronic Materials	
Other Learning Materials	

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	Classrooms, Physics Laboratory and computer with internet lab.
Technology equipment (projector, smart board, software)	Computer Lab. and internet lab, data show, Smart Board.
Other equipment (depending on the nature of the specialty)	Library with textbook 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
Other	Internal Reviewer committee	Direct

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

Assessment Methods (Direct, Indirect)

G. Specification Approval

COUNCIL /COMMITTEE	**DEPARTMENT COUNCIL**
REFERENCE NO.	**16**
DATE	**30-12-2024**