



Course Specification

(Bachelor)

Course Title: : **Electricity and Magnetism**

Course Code: **PHY 1221**

Program: **Bachelor of Science in Applied Mathematics**

Department: **Physics**

College: **Science**

Institution: **Imam Mohammad Ibn Saud Islamic University**

Version: **4**

Last Revision Date: **26/09/2024**



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A. General information about the course:

1. Course Identification

1. Credit hours: (3)

2. Course type

A. ☐ University ☐ College ☒ Department ☐ Track ☐ Others
B. ☐ Required ☒ Elective

3. Level/year at which this course is offered: (Level 6-7/ Year 3-4)

4. Course General Description:

This course covers the foundation of electricity and magnetism. In this course, students will develop solid and systematic problem-solving skills, and to lay the foundations for further studies in physics. It begins with electric fields, Gauss' law, electric potential. Capacitance and dielectrics are introduced, and then the course moves to the magnetic field, faraday's law, inductance, alternating current circuits. This course is designed to provide students with a working knowledge of the elementary physics principles mentioned above, as well as their applications, and to enhance their conceptual understanding of physical laws.

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

General Physics, PHY 1101 and Calculus (3), MAT 1203.

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

7. Course Main Objective(s):

- Provide the basic concepts and build a strong foundation in the principles of electricity and magnetism.
- Analyze different physical situations and phenomena in terms of the fundamental laws of electricity and magnetism.
- Understand how these principles are applied in the world around us.
- Demonstrate competence with a wide variety of mathematical tools and techniques.

2. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	60	100%
2	E-learning		
3	Hybrid <ul style="list-style-type: none"> • Traditional classroom 		





No	Mode of Instruction	Contact Hours	Percentage
	• E-learning		
4	Distance learning		

3. Contact Hours (based on the academic semester)

No	Activity	Contact Hours
1.	Lectures	30
2.	Laboratory/Studio	0
3.	Field	-
4.	Tutorial	30
5.	Others (specify)	0
Total		60

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	Describe the behavior of systems in linear and rotational motions.	K1, K2	<ul style="list-style-type: none"> Lectures. Tutorials. Class discussions. 	<ul style="list-style-type: none"> Exams. Participation. Discussions.
1.2	Outline the concepts of the linear, angular momentum and Kepler's laws.	K1, K2	<ul style="list-style-type: none"> Lectures. Tutorials. Class discussions. 	<ul style="list-style-type: none"> Exams. Homework. Quizzes.
1.3	State the basic knowledge of gravitational force, potential and associated law.	K1, K2	<ul style="list-style-type: none"> Lectures. Class discussions. Tutorials. 	<ul style="list-style-type: none"> Participation. Exams. Discussions. Homework.
2.0	Skills			
2.1	Explain and summarize the basic knowledge gained from studying mechanics.	S1, S2	<ul style="list-style-type: none"> Lectures. Class discussions. Tutorials. 	<ul style="list-style-type: none"> Exams. Discussions. Participation.
2.2	Develop the students ability to solve and analyze problems in physics related the topics covered by the course.	S2, S3	<ul style="list-style-type: none"> Problem classes and group tutorial. Homework assignments as well as problems solutions. 	<ul style="list-style-type: none"> Exams. Discussions. Homework.



Code	Course Learning Outcomes	Code of PLOs aligned with the program	Teaching Strategies	Assessment Methods
2.3	Communicate in a clear and concise manner orally, and using IT for acquiring and analyzing information.	S4, S5	<ul style="list-style-type: none"> Lectures. Class discussions. Tutorials. Encourage students to use electronic mail and internal network for submitting homework and assignments. Use digital library. 	<ul style="list-style-type: none"> Exams. Participation and activities of students in the course community and blackboard. Homework.
3.0	Values, autonomy, and responsibility.			
3.1	Show the collaboration and inter-professionalism in class discussions or team works, as well as solve problems independently.	V1, V2, V3	<ul style="list-style-type: none"> Small team tasks Open discussion at classroom. Office hours. 	<ul style="list-style-type: none"> Participation. Homework. Mini-project(s).

C. Course Content

No	List of Topics	Contact Hours
1.	Electric Fields: Electric charges, Coulomb's law, the electric field, electric field of a continuous charge distribution, motion of charged particles in a uniform electric field.	8
2.	Gauss's Law: electric field lines, electric flux, Gauss's law, application of Gauss's law to various charge distributions, conductors in electrostatic equilibrium.	8
3.	Electric Potential: Potential energy and electric potential, electric potential difference in a uniform electric field, electric potential due to point charges, obtaining the value of the electric field from the electric potential, electric potential due to continuous charge distributions, electric potential due to charged conductor, application of electrostatics.	8
4.	Capacitance and dielectrics: Definition of capacitance, calculating capacitance for parallel plate capacitors, connection of capacitors, energy stored in a charged capacitor, capacitors with dielectrics, RC circuits.	8
5.	Sources of the Magnetic Field: The Biot-Savart's law, the magnetic force between two parallel conductors, Ampere's law, the magnetic field of a solenoid, magnetic flux, Gauss's law in magnetism, displacement current and the generalized Ampere's law.	8
6.	Faraday's law: Faraday's law of induction, motional emf, Lenz's law, induced emfs and electric fields, generators and motors, Eddy currents.	8
7.	Inductance: Self-inductance, RL circuits, energy in a magnetic field, mutual inductance, oscillation in an LC circuit, the RLC circuit.	8



8.	Alternating Current Circuits: AC sources, Resistors in an AC circuit, Inductors in an AC circuit, Capacitors in an AC circuit, the RLC series circuit, Power in an AC circuit, resonance in a series RLC circuit, the transformer.	4
Total		60

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Class Activities (class quizzes, homework, solving problems, etc.....)	weekly	10 %
2.	Midterm Exam 1	6thweek	25 %
3.	Midterm Exam 2	12thweek	25 %
4.	Final Exam	16thweek	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	- Serway R.A. and Jewett J.W., <i>Physics for Scientists and Engineers with Modern Physics</i> , 9 th Edition, Brooks/Cole, Belmont, CA, USA (2014).
Supportive References	- Halliday D. and Resnick R., <i>Physics</i> , 9 th Edition, John Wiley and sons (2011).
Electronic Materials	https://units.imamu.edu.sa/colleges/en/science/Pages/default.aspx
Other Learning Materials	

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	- Classrooms. - Labs.
Technology equipment (projector, smart board, software)	- Classroom equipped with a whiteboard and a projector.
Other equipment (depending on the nature of the specialty)	



F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	- Students - Second examiner	- Indirect (The students complete the evaluation forms at the end of term. Final exam is evaluated by the second examiner)
Effectiveness of Students assessment	- Instructors	- Direct (exams, HW, project, ...)
Quality of learning resources	- Faculty - Students	- Indirect (surveys)
The extent to which CLOs have been achieved	- Instructors - Program Leaders	- Direct (excel sheet)
Other		

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

Assessment Methods (Direct, Indirect)

G. Specification Approval

COUNCIL /COMMITTEE	Quality Unit-Physics Department
REFERENCE NO.	Department council No. 06
DATE	26/09/2024

