هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

اعتماد NCAAA T4 2020

Course Specifications

Course Title:	**Electricity and Magnetism 1**
Course Code:	**PHY2301**
Program:	**BSc**
Department:	**Physics**
College:	**Applied Sciences**
Institution:	**Umm Al-Qura University**

Table of Contents

A. Course Identification

1. Credit hours: 4hrs
2. Course type **a.** University ☐ College ☐ Department ■ Others ☐ **b.** Required ■ Elective ☐
3. Level/year at which this course is offered: Level 4/ 2nd years
4. Pre-requisites for this course (if any): General physics 2
5. Co-requisites for this course (if any):

6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	**Traditional classroom**	4	100%
2	**Blended**		
3	**E-learning**		
4	**Distance learning**		
5	**Other**		

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	**Lecture**	40 Hours
2	**Laboratory/Studio**	
3	**Tutorial**	
4	**Others** (specify) Exams & quizzes	
	Total	40 Hours

B. Course Objectives and Learning Outcomes

1. Course Description

This course will provide a conceptual background in physics sufficient to enable students to take courses that are more advanced in related fields. It covers the following: Electric charge, electric fields, superposition, Gauss' Law, surface integrals, electric flux, the electric potential, simple circuits, Ohm's Law, and capacitors.

2. Course Main Objective

1. Provide and define the fundamental properties of the electric charge, solve technical problems associated with the electrostatic force (Coulomb force),
2. Identify that at every point in the space surrounding a charged particle, the particle sets up an electric field, which is a vector quantity and thus has both magnitude and direction.
3. Identify how an electric field can be used to explain how a charged particle can exert an electrostatic force on a second charged particle even though there is no contact between the particles.
4. Explain how a small positive test charge is used (in principle) to measure the electric field at any given point.
5. Define electric capacitance and solve technical problems associated with capacitors of various symmetries, capacitors in series and parallel combination, the microscopic effect of dielectric materials on capacitance and stored energy.
6. Define electric current, current density, and solve technical problems involving DC networks of resistors, batteries, and capacitors, Ohm's Law, Kirchhoff's laws, and RC charging and decay circuits.
7. Calculate the potential difference between any two points in a circuit.
8. Distinguish a real battery from an ideal battery and, in a circuit diagram, replace a real battery with an ideal battery and an explicitly shown resistance.
9. Calculate the net rate of energy transfer in a real battery for current in the direction of the emf and in the opposite direction.

3. Course Learning Outcomes

	CLOs	Aligned PLOs
1	**Knowledge and Understanding**	
1.1	Define fundamental concepts of electric charge, electric current, and electric field	K1-I
1.2	Extract electric potential from electric field, and vice versa	K1-I
1.3		K1-I
1.4	Investigate fundamentals of linear electric circuit components and how their operation is governed by the fundamental laws of electricity.	K2-I
2	**Skills :**	
2.1	Use physical laws and principles to calculate the electric field and the potential difference.	S1-P
2.2	analyze electric circuit	S1-P
2.3		S2-I
2.4		S2-P
2.5		S2-I
3	**Values:**	
3.1		V1-I
3.2	Collaborate with the others to resolve problems.	V2-I

C. Course Content

No	List of Topics	Contact Hours

1	**Coulomb's Law** Electric Charge, Conductors and Insulators, Coulomb's Law, Charge is quantized, Charge is conserved.	6
2	**Electric Fields** The Electric Field, Electric field lines, Electric Field Due to a Charged particle, Electric Dipole, The Electric Field Due to an Electric Dipole, Electric Field Due to a line of charge, The Electric Field Due to a Charged Disk, A Point Charge in an Electric Field, A Dipole in an Electric Field,	6
3	**Gauss' Law** Flux of an Electric Field, Gauss' Law, Gauss' Law and Coulomb's Law, A Charged Isolated Conductor, Applying Gauss' Law: Cylindrical Symmetry, Applying Gauss' Law: Planar Symmetry, Applying Gauss' Law: spherical Symmetry.	6
4	**Electric Potential** Electric Potential, Electric Potential Energy, Equipotential surfaces, Calculating the potential from the field, Potential Due to a Point Charge, Potential Due to a group of Point Charges, Potential Due to an Electric Dipole, Potential Due to a Continuous Charge Distribution, Calculating the field from the potential, Electric Potential Energy of a System of Point Charges, Potential of a Charged Isolated Conductor.	6
5	**Capacitance** Capacitors, Capacitance, Calculating the Capacitance, Capacitors in Parallel and in Series, Energy Stored in an Electric Field, Capacitor with a Dielectric. Dielectrics and Gauss' Law.	4
6	**Current and Resistance** Electric Currents, Current density, Resistance and Resistivity, Ohm's Law, Power in Electric Circuits. Semiconductors, Superconductors.	6
7	**Circuits** Single-Loop circuits, "Pumping" Charges, Work, Energy, and Emf, Calculating the Current in a Single-Loop Circuit, Other Single-Loop Circuits, Potential Difference Between Two Points, Multiloop Circuits (resistors in parallel and in series), The Ammeter and the Voltmeter, RC Circuits, Charging and Discharging a Capacitor. Sample problems.	6
Total		**40**

D. Teaching and Assessment

1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.0	**Knowledge and Understanding**		
1.1	Recognize fundamental concepts of electric charge, electric current, and electric field.	1. Demonstrating the basic information and principles	1- Mid-term

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.2	Extract electric potential from electric field, and vice versa	through lectures and the achieved applications 2. Discussing phenomena with illustrating pictures and diagrams 3. Lecturing method: 4. Tutorials 5. Revisit concepts 6. Discussions 7. Start each chapter by general idea and the benefit of it; 8. Show the best ways to deal with problem; 9. Build a strategy to solve problem.	theoretical exam 2- Short quizzes. 3- Final theoretical exam
1.3	Explain how charges and currents respond to electric field and also how charges and current generate electric field.		
1.4	Investigate practical fundamentals of linear electric circuit components and how their operation is governed by the fundamental laws of electricity.		
2.0	**Skills**		
2.1	How to use physical laws and principles to calculate the electric field and the potential difference.	1. Preparing main outlines for teaching. 2. Following some proofs 3. Define duties for each chapter. 4. Homework assignments 5. Encourage the student to look for the information in different references.	1. Exams, short quizzes. 2. Asking about physical laws previously taught. 3. Discussions of how to simplify or analyze some phenomena.
2.2	How to simplify problems and analyze circuit		
2.3	Analyse and solve technical problems associated with capacitors of various symmetries,		
2.4	Calculate the net rate of energy transfer in a ideal and real batterys.		
2.5	Represent the physical problems mathematically.		
3.0	**Values**		
3.1	Relate theoretical scientific concepts to experimental results, Think in solving problems, Search on the internet,	· Active learning · Small group discussion	· Evaluate the work in team
3.2	Collaborate with the others to resolve problems.		

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Exercises & Home works	All weeks	10 %
2	Quizzes	All weeks	10 %
3	Midterm's exam	8th week	30 %
4	Final Exam (theoretical)	End of the term	50 %

*Assessment task (i.e., written test, oral test, oral presentation, group project, essay, etc.)

E. Student Academic Counseling and Support

Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice: Each student will supervise by academic adviser in physics department and the time table for academic advice were given to the student each semester.

F. Learning Resources and Facilities

1.Learning Resources

Required Textbooks	Fundamentals of Physics, by David Halliday, Robert Resnick, Jearl Walker, Wiley; 10th Edition, Extended Edition: 978-1-119-46013-8
Essential References Materials	
Electronic Materials	The website of the course.
Other Learning Materials	

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	Classrooms and library.
Technology Resources (AV, data show, Smart Board, software, etc.)	
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
1. Following up the progress of students in the course.	Instructor	Homework & quiz
2. Evaluating the progress of student	Instructor	Questionnaires.
3. Evaluating the instructor	Student	Questionnaires.
4. Revision of Exam paper	Another staff member	Standers of the exam papers

Evaluation areas (e.g., Effectiveness of teaching and assessment, Extent of achievement of course learning outcomes, Quality of learning resources, etc.)
Evaluators (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)
Assessment Methods (Direct, Indirect)

H. Specification Approval Data

Council / Committee	
Reference No.	
Date	