هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

اعتماد NCAAA T4 2020

Course Specifications

Course Title:	**Electromagnetism 1**
Course Code:	**PHY3304**
Program:	**Physics**
Department:	**Physics**
College:	**Applied Sciences**
Institution:	**Umm Al-Qura University**

Table of Contents

A. Course Identification

1. Credit hours: 4
2. Course type **a.** University ☐ College ☐ Department ☑ Others ☐ **b.** Required ☑ Elective ☐
3. Level/year at which this course is offered: Level 7th / 3rd year
4. Pre-requisites for this course (if any)**: Electricity and Magnetism (3)**
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**	40	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
2	**Laboratory/Studio**	
3	**Tutorial**	
4	**Others** (specify)	
	Total	40

B. Course Objectives and Learning Outcomes

1. Course Description

This course deals primarily with a vector analysis-based description of static electric field, electric flux, and electric potential for a distribution of charges, and application of Gauss's law. Also, the course covers the methods of solving electrostatic problems such as Laplace equation, and electrostatic images. The course will cover the problems of calculating the electric fields and electric potential inside and outside the dielectric materials as well as the molecular field, and electrostatic energy.

2. Course Main Objective

The student will be able to

- Use vector analysis for solving electrostatic problems and expression of electric fields, electric flux, and electric potential for charge distribution.
- Solve the electrostatic problems using Laplace's equation and electrostatic images.
- Calculate the electrostatic fields and electrostatic potential outside and inside the dielectric materials.

- Calculate the molecular field of a dielectric. - Calculate the electrostatic energy.

3. Course Learning Outcomes

CLOs		Aligned PLOs
1	**Knowledge and Understanding**	
1.1	Define the physical quantities related to the static electricity.	K1
1.2	Describe the concepts and laws related to the static electricity using vector analysis.	K1
2	**Skills :**	
2.1	Solve problems related to the static electricity using vector analysis.	S1
2.2	Explain the physical formulas related to the static electricity.	S2
3	**Values:**	
3.1	Work effectively and responsibly in teamwork.	V2

C. Course Content

No	List of Topics	Contact Hours
1	**Review on Vector Analysis** • Vector formulas. • Vector operations. • The line integral. • The surface integral. • The divergence theorem. • Stokes' theorem. • Cartesian, spherical, and cylindrical Coordinates.	5
2	**Electrostatics** • Electric charge. • Coulomb's law. • The electric field. • Electrostatic potential. • Conductors & insulators. • Gauss's law. • The electric dipole.	14
3	**Solution of electrostatic problems** • Poisson's equation. • Laplace's equation. • Laplaces's equation in one independent variable. • Laplace's equation in spherical coordinates (harmonic zone). • Conducting sphere in uniform. • Electrostatic images.	6
4	**The Electrostatic Field in Dielectric Media**	5

	• Polarization. • Field outside of a dielectric medium. • The electric field inside a dielectric. • The electric displacement. • Electric susceptibility and dielectric Constant. • Point charge in a dielectric field. • Boundary conditions on the field vector. • Boundary value problem involving dielectrics.	
5	**Microscopic Theory of Dielectrics** • Molecular field in a dielectric. • Induced dipoles. • Polar molecules. The Langevin-Debye formula. • Permanent polarization. Ferroelectricity.	5
6	**Electrostatic Energy** • Potential energy of a group of point charges. • Energy density of an electrostatic field. • Energy of a system of charged conductors. • Capacitors.	5
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	Define the physical quantities related to the static electricity.	1. Demonstrating the basic principles through lectures. 2. Discussing phenomena with illustrating pictures and diagrams. 3. Lecturing method: Board, Power point. 4. Discussions 5. Brain storming Start each chapter by general idea and the benefit of it.	- Solve some examples - Discussions during the lectures Exams: a) Quizzes. b) Midterm exams. c) Final exam.
1.2	Describe the concepts and laws related to the static electricity using vector analysis.		
2.0	**Skills**		
2.1	Solve problems related to the static electricity using vector analysis.	1. Preparing main outlines for teaching.	1. Exams: a) Quizzes. b) Midterm exams.

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
2.2	Explain the physical formulas related to the static electricity.	2. Following some proofs. 3. Define duties for each chapter	c) Final exam 2. Homework's.
3.0	**Values**		
3.1	Work effectively and responsibly in teamwork.	• Organize the students in a small groups (teamwork). • Give students tasks of duties as a small project.	• Evaluate the scientific reports. • Discussing the reports with each teamwork. • Evaluate the efforts of each student in preparing the report.

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Midterm Exam	8th	30%
2	Homework's & Quizzes& Reports	All weeks	20 %
3	Final Exam	End of the semester	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 be supervised by academic adviser in Physics Department and the time table for academic advice were given to the student each semester. (4 hrs per week)

F. Learning Resources and Facilities

1.Learning Resources

Required Textbooks	Foundations of Electromagnetic Theory by John R. Reitz, and Frederick J. Milford (1960).
Essential References Materials	
Electronic Materials	
Other Learning Materials	• Introduction to Electrodynamics by David J. Griffiths, 4th edition. • Modern Electrodynamics by Andrew Zangwill, (2013). • Electromagnetic Fields by Roald K. Wangsness, 2nd edition.

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	- Classroom
Technology Resources (AV, data show, Smart Board, software, etc.)	- Black Board - Data show
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
Effectiveness of teaching Strategies	Students	Questionnaire
Effectiveness of student assessment	Instructor	Exams
Extent of achievement of course learning outcomes	Instructor	Course report
Quality of learning resources	Instructor	Course report

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	