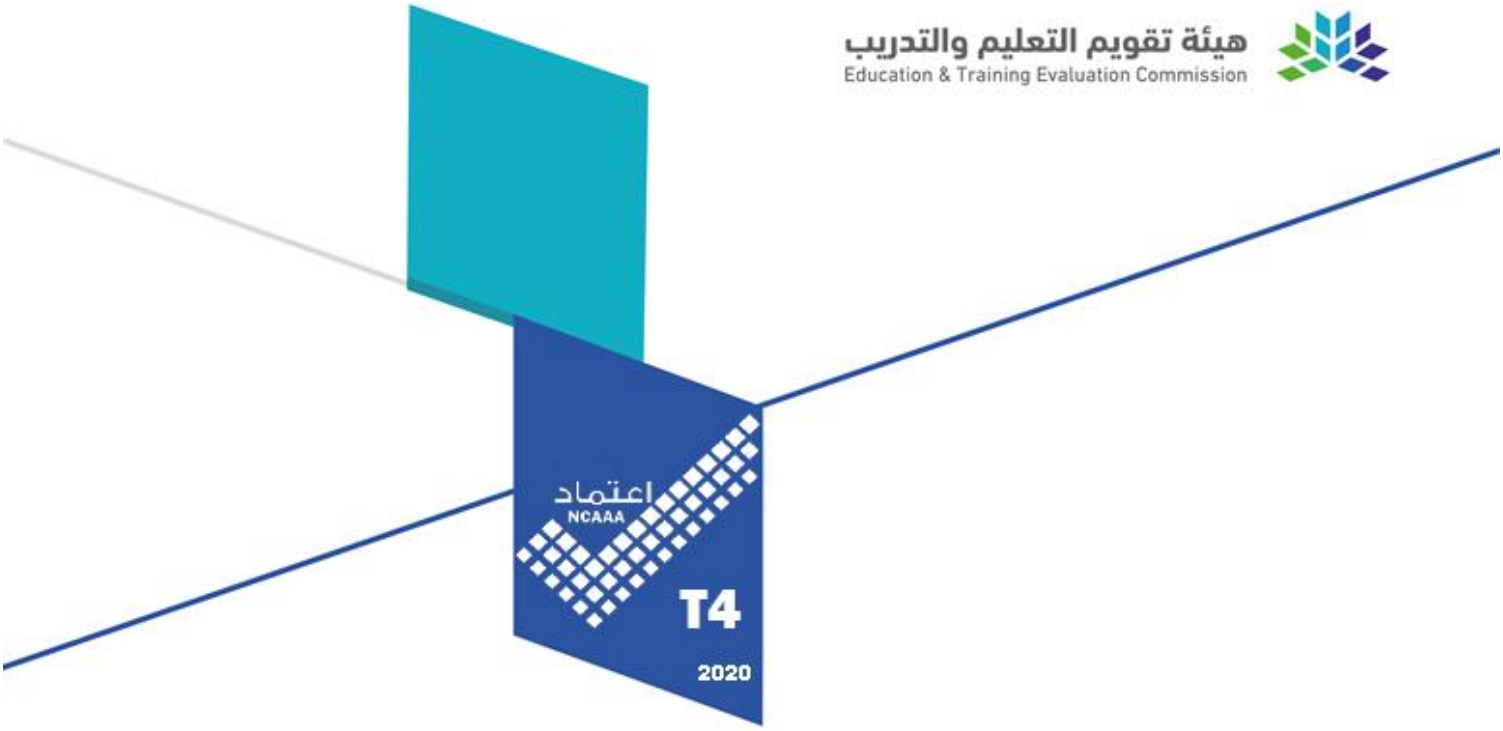
هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission



Course Specifications

Course Title:	Electrodynamics
Course Code:	**331PHYS**
Program:	**Physics**
Department:	**Physics**
College:	**Science**
Institution:	**Jazan University**

Table of Contents

A. Course Identification

1. Credit hours: 3
2. Course type **a.** University ☐ College ☐ Department ☑ Others ☐ **b.** Required ☑ Elective ☐
3. Level/year at which this course is offered: Level 5/ Year 3
4. Pre-requisites for this course (if any)**:231 PHYS**
5. Co-requisites for this course (if any)**: NIL**

6. Mode of Instruction (mark all that apply)

Percentage	Contact Hours	Mode of Instruction	No
84%	38	Traditional classroom	1
16%	7	Blended	2
		E-learning	3
		Correspondence	4
		Other	5

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	Lecture	42
2	Laboratory/Studio	--
3	Tutorial	3
4	Others (specify)	
	Total	45

B. Course Objectives and Learning Outcomes

1. Course Description

This course discusses the electric phenomena when the charge is assumed to be at rest (electrostatics), magnetic phenomena under steady state current consideration (magnetostatics) and some special techniques. The course mainly focuses on establishing the notion of electrodynamics based on the time and spatial dependence of the electric and magnetic fields. It also encompasses Maxwell's equations and derivation of electromagnetic wave equation for vacuum and material medium.

2. Course Main Objective

This course is designed to provide the students with:

1. The mathematics of vector operations, vector calculus, and the curvilinear coordinates
2. The fundamental background and the foundation of electrodynamics.
3. Problem-solving skills to calculate the electric and magnetic fields as well as the electrostatic problems using special techniques

4. a depth understanding to electrostatics and magneticstatics concept,
5. The experimental and theoretical origin of Maxwell's equations
6. Mathematical techniques to derive and solve the wave equation
7. Knowledge with the fundamental properties of the electromagnetic wave propagation in vacuum and different medium.

3. Course Learning Outcomes

	CLOs	Aligned PLOs
1	**Knowledge and Understanding**	
1.1	**Describe:** the electric field of different charge distributions, the electric flux, electric potential of localized charge distributions and in term of electric field, the magnetic force, the current, the electromotive force, the magnetic flux, and the induced electric field,. the electromagnetic wave parameters	**PLO1.1**
1.2	**State**: the summary of electrostatic boundary conditions, the work and energy of point and continuous charge distributions, the comparison between electrostatic and magnetostatic, Maxwell's equations in differential and integral form	**PLO1.2**
1.3	**Discus** The properties of the electric field lines, the properties of the magnetic field, the properties of the monochromatic plane wave solution in vacuum	**PLO1,2**
2	**Skills :**	
2.1	**Apply** the fundamental theorem of differential and integral calculus in electrodynamics, Gauss's law to calculate the electric field, method of images to determine the induced charge surface, Biot-Savart and Amperes' law to find the magnetic field .	**PLO2.1**
2.2	**Derive** Gauss's law in differential and integral form, Poisson and Laplace' equations, the continuity equation of charge, Faraday's Law of induction, Ampere's law, the wave equation in different media	**PLO2.2**
2.3	**Solve** the wave equation in vacuum and material	**PLO2.1**
2.4	**Explain** how Faraday fixed electrostatics laws and how Maxwell fixed Ampere law	**PLO2.2**
3	**Values:**	
3.1	**Develop** skills of working in groups in group assignments and discussion and bear individual responsibility in the assigned tasks	**PLO3.1**

C. Course Content

Contact Hours	List of Topics	No
HOURS 9	**1. Vector analysis** 1.1 Vector Algebra**:** vector operations, component form, triple product, position vector and displacement 1.2 Differential calculus: gradient, del operator, divergence, curl. Second derivatives with examples. 1.3 Integral calculus: Line, surface and volume integrals. The fundamental theorem of calculus, the fundamental theorem for gradients, the fundamental theorem for divergences, the fundamental theorem for curls. 1.4. Curvilinear Coordinates: spherical polar and cylindrical coordinates	1
HOURS 9	**2. Electrostatics**	2

	2.1 The electric field. 2.2 Divergence and curl of electrostatic fields. 2.3 Electric potential. 2.4 Work and energy in electrostatics.	
HOURS 6	**3. Special techniques** 3.1. Laplace equation 3.2. The Method of Images	3
HOURS 9	**4. Magnetostatics** 4.1 Lorentz force law: magnetic fields, magnetic forces, currents 4.2 The Biot-Savart law: steady current, magnetic field of steady current 4.3 Divergence and curl of B: Application of Ampere's law, Comparison of magnetostatics and electrostatics.	4
HOURS 6	**5. Electrodynamics** 5.1 Electromotive force: Ohm' law. Electromotive force, emotional electromotive force. 5.2 Electromagnetic induction: Faraday's law. Section, the induced electric field 5.3 Maxwell equations. Electrodynamics before Maxwell, Fix Maxwell's equations, Maxwell's equation.	5
HOURS 6	**6. Electromagnetic waves** 6.1 Waves in one dimension: the wave equation, sinusoidal waves, polarization. 6.2 Electromagnetic waves in vacuum: The wave equation of E and B, monochromatic plane waves, energy and momentum in electromagnetic waves.	6
45	**Total**	

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	**Describe:** the electric field of different charge distributions, the electric flux, electric potential of localized charge distributions and in term of electric field, the magnetic force, the current, the electromotive force, the magnetic flux, and the induced electric field, . the electromagnetic wave parameters	Lectures, discussion comparisons	**Direct** (formative and summative): In class interactive questioning, quizzes, written exams **Indirect:** student survey
1.2	**State**: the summary of electrostatic boundary conditions, the work and energy of point and continuous charge distributions, the comparison between electrostatic and	Lectures, discussion	**Direct** (formative and summative): In class interactive questioning, quizzes, written exams **Indirect:** student survey

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
	magnetostatic, Maxwell's equations in differential and integral form		
1.3	**discus** The properties of the electric field lines, the properties of the magnetic field, the properties of the monochromatic plane wave propagation in vacuum	Lectures, discussion	**Direct** (formative and summative): In class interactive questioning, quizzes, written exams **Indirect:** student survey
2.0	**Skills**		
2.1	**Apply** the fundamental theorem of differential and integral calculus in electrodynamics, Gauss's law to calculate the electric field, method of images to determine the induced charge surface, Biot-Savart and Amperes' law to find the magnetic field .	Lectures, discussion	**Direct** (formative and summative): In class interactive questioning, quizzes, written exams **Indirect:** student survey
2.2	**Derive** Gauss's law in differential and integral form, Poisson and Laplace' equations, the continuity equation of charge, Faraday's Law of induction, Ampere's law, the wave equation in different media	Lectures, discussion, Tutorial	**Direct** (formative and summative): In class interactive questioning, quizzes, written exams **Indirect:** student survey
2.3	**Solve** the wave equation in vacuum and material	Lectures, Discussion, Tutorial	**Direct** (formative and summative): In class interactive questioning, quizzes, written exams **Indirect:** student survey
2.4	**Explain** how Faraday fixed electrostatics laws and how Maxwell fixed law	Lectures, Discussion, Tutorial	**Direct** (formative and summative): In class interactive questioning, quizzes, written exams **Indirect:** student survey
3.0	**Values**		
3.1	**Develop** skills of working in groups in group assignments and discussion and bear individual responsibility in the assigned tasks	Discussion, question and answer	**Direct** In class interactive questioning, quizzes, written exams **Indirect:** student survey

2. Assessment Tasks for Students

Percentage of Total Assessment Score	Week Due	*Assessment task	#
2.5 (2.5%)	**3**	**Assignment 1**	**1**
2.5 (2.5%)	**6**	**Assignment 2**	**2**
5 (5 %)	**7**	**Quiz I**	**3**
15 (15%)	**8**	**First Mid-term exam**	**4**
2.5 (2.5%)	**11**	**Assignment 3**	**5**

Percentage of Total Assessment Score	Week Due	*Assessment task	#
2.5 (2.5%)	**13**	**Assignment 4**	**6**
5 (5%)	**14**	**Quiz II**	**7**
15 (15%)	**14**	**Second mid-term exam**	**8**
50 (50%)	**16**	**Final Exam**	**9**

***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 group of students is assigned to a staff member who will be available for help and academic guidance office hours at specific 2hr on daily basis.

F. Learning Resources and Facilities

1.Learning Resources

Required Textbooks	Introduction to Electrodynamics, 3rd Edition, Dived J. Griffiths, Prentice-Hall-, Inc., Englewood Cliffs, 1991
Essential References Materials	- Foundations of Electromagnetic Theory, 4th Edition, John R. Reitz, Frederick J. Milford, Robert W. Christy, Addison-Wesley Publishing Company, Inc., 2008
Electronic Materials	• *e-Learning* in the School of *Physics* and Astronomy *(www.ph.ed.ac.uk/elearning)* • Physical Sciences Resource Center (PSRC) (www.psrc-online.org*)* • The Physics Homepage (*www.physics.ox.ac.uk)*
Other Learning Materials	• Mathematical packages: *Mathematica*, Math Lab, and Maple. • Software: Virtual Physics

2. Facilities Required

Resources	Item
Class room	**Accommodation** Classrooms, laboratories, demonstration) (.rooms/labs, etc
Data show- smart boar	**Technology Resources** AV, data show, Smart Board, software,) (.etc
None	**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	Students, Peer and program leader	Indirect (CES)- Indirect peer evaluation
Assessment	Students, Program assessment committee	Direct/ Indirect
Extent of achievement of course learning outcomes	Instructor	Direct/Indirect
Quality of learning resources	Students, Faculty members	Indirect

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	Department council
Reference No.	8
Date	16/4/1442