2023
TP-153

Course Specification
(Bachelor)

Course Title:	Electromagnetics I
Course Code:	EE1271
Program:	Electrical Engineering
Department:	Electrical Engineering
College:	College of Engineering
Institution:	Imam Mohammad Ibn Saud Islamic University
Version:	V5
Last Revision Date:	10-10-2025

Table of Contents

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: (5th level, 3rd year)					
4. Course general Description:					
Coulomb's law. Gauss's law. Electric potential. Electric boundary conditions. Electric dipoles. Resistance, capacitance. Laplace's equation, Biot-Savart law, Ampere's law. Scalar and vector potentials. Magnetic boundary conditions, inductance. Introduction to time varying fields.					
5. Pre-requirements for this course (if any):					
PHYS1118, MATH1207, EE1201					
6. Co-requisites for this course (if any):					
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7. Course Main Objective(s):					
To develop an understanding of field concepts leading to the derivation of Maxwell's equation, calculate electric and magnetic fields of symmetrical and non-symmetrical charge distributions in Cartesian, cylindrical, and spherical coordinates using Maxwell's equations. And solve boundary-value problems of symmetrical charge distributions and calculate capacitance and inductance of devices having different charge and current distributions.					

2. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	60	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**	-
3.	**Field**	-
4.	**Tutorial**	15
5.	**Others (specify)**	-
Total		60

B. Course Learning Outcomes (CLOs), Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
1.0	**Knowledge and understanding**			
K1	Apply basic laws to calculate electrostatic and magnetostatic fields for various configurations.	1.5	Homework In-Class Quizzes Final Exam	Quizzes in class Midterm exam Final exam
K1	Calculate resistance, capacitance, and inductance for different configurations.	1.3	Final Exam Homework Presentations In-Class Quizzes	Quizzes in class Midterm exam Final exam
K1	Be acquainted with the utilization of vector calculus to solve engineering electromagnetic problems.	1.4	In-Class Quizzes Homework	Quizzes in class Midterm exam Final exam
K1	Analyze the effects of material type on electrostatic and magnetostatic fields.	1.6	Final and Midterm Exams Homework	Quizzes in class Midterm exam Final exam
K1	Calculate electrostatic and magnetostatic potential and energy.	1.6	Final Exam Homework Presentations In-Class Quizzes	Quizzes in class Midterm exam Final exam
2.0	**Skills**			
S1	Devise analysis techniques based on Maxwell's equations for electrostatic and magnetostatic field problems.	2.5	Final and Midterm Exams Homework	Quizzes in class Midterm exam Final exam

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
3.0	**Values, autonomy, and responsibility**			
V1	Illustrate using new technologies: - Word, Power point in preparing their reports/oral presentation	3.6	Project Assignment	Project Report

C. Course Content

No	List of Topics	Contact Hours
1	**Vector algebra**: scalar and vector, vector addition ,subtraction and multiplication. Coordinate and transformation: Cartesian, cylindrical and spherical. **Vector calculus**	10
2	**Electrostatic field**: coulomb law, flux density, Gauss's law, electric potential, dipole and flux	12
3	**Electric fields in material space**: properties of materials, conductor dielectric,	10
4	**Electrostatic boundary-value problems**: Poisson's and laplace's equations,	8
5	**Magnetostatic fields**: Biot-Savart's law, ampere circuit law, applications, Maxwell equations, magnetic scalar and vector potential	12
6	**Magnetic forces and devices**: magnetic forces and magnetization, inductors and inductance, Farady's law	8
Total		**60**

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	8 HWs	1 week from posting	10%
2.	5 quizzes	To be announced	10%
3.	2 term exams	To be announced	40%
4.	Final exam	To be announced	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	Elements of Engineering Electromagnetics by Matthew Sadiku, 5th Edition/or latest: Oxford University Press
Supportive References	1- John D. Kraus, Electromagnetics, McGraw-Hill.

	2-Clayton Paul, Electromagnetics for Engineers, Wiley. 3- S. Wentworth, Fundamentals of Electromagnetics with Engineering Applications, Wiley.
Electronic Materials	Computer animations and online resources supplied by the instructor.
Other Learning Materials	Different Online sites.

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	One classroom: fits up to 25 students with white board.
Technology equipment (projector, smart board, software)	A laptop computer connected to a projector to display PowerPoint presentations
Other equipment (depending on the nature of the specialty)	N/A

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	**Students**	**Indirect**
Effectiveness of Students assessment	**Students**	**Indirect**
Quality of learning resources	**Relevant Focus Group**	**Indirect**
The extent to which CLOs have been achieved	**Dept. Quality Committee**	**Direct**
Other		

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

Assessment Methods (Direct, Indirect)

G. Specification Approval

COUNCIL /COMMITTEE	
REFERENCE NO.	
DATE	