EC341- Electromagnetics

CREDIT HOURS

3 Hours

CONTACT HOURS (Hours/week)

Lecture: 2; Tutorial: 2

COURSE COORDINATOR

Dr. Mohammed Abou-El Dahb

TEXT BOOK

Hayt, Engineering Electromagnetics, by McGraw-Hill, Inc., Latest Edition.

COURSE DESCRIPTION

Review of vector analysis, electromagnetic fields: Coulombs law, electric field and flux density , Gauss's law, electric potential, conductors and semi –conductors, dielectric and capacitance, polarization, magnetic field and flux density, Biot Savart law, Ampere's law, magnetic potential. Maxwell's equations, and magnetization vectors, analogy between electrostatics and magnetostatic, boundary conditions.

PREREQUISITE:

BA 114, BA 224

RELATION OF COURSE TO PROGRAM

Required

COURSE INSTRUCTION OUTCOMES

The student will be able to:

- Concise treatment of vector analysis.
- Analyze of electrostatic field due to different forms of electric charges.
- Study of moving charges, conductor, semiconductor and dielectric.
- Analyze of magnetostatic field due to different forms of current element

TOPICS COVERED

- Vector analysis "Scalars and vectors, Vector algebra, The Cartesian coordinatesystems, different types of vector product, Vector components and unit vectors,"
- Coulomb's law and electric field intensity "The experimental law of Coulomb, electric field intensity"
- Electric field intensity for some sources of charge "Electric field intensity of line charge, Electric field intensity of surface charge"
- Electric flux density, Gauss's law and divergence "Electric flux density, Gauss's law, Application of Gauss's law, Divergence law, Divergence theorem
- Conductors and Semiconductors " Current and current density, Conductor properties and Boundary conditions, Ohm's Law, Advantages of semiconductors"

- Dielectric and capacitance" The nature of dielectric materials, Polarization, Boundary conditions for perfect dielectric materials, Capacitance"
- The steady magnetic field "Biot-Savart law, Ampere's circuital law, Curl, Stocke's theorem"
- Magnetic flux and magnetic field " Determination of the steady magnetic field for different current elements, The scalar and vector magnetic potentials,"
- Magnetic forces "Force on a moving charge, Force on a different current element, Application on the force between different current elements"
- Magnetic materials "The nature of magnetic materials, Magnetization, Magnetic boundary conditions, Potential energy and forces on magnetic materials,"
- Time-varying fields" Faraday's law, Displacement current, Maxwell's equations, The retarded potential, The magnetic circuit, Inductance,"

CONTRIBUTION OF COURSE TO MEET THE REQUIREMENTS OF CRITERION 5:

Professional component Content			
Math and Basic Sciences	**Engineering Topics**	**General Education**	**Other**
	✓		

RELATIONSHIP OF COURSE TO STUDENT OUTCOMES:

Student Outcomes		Course aspects
A	An ability to apply knowledge of mathematics, science, and engineering	a_1 a_2
B	An ability to design and conduct experiments, analyze and interpret data.	
C	An ability to design a system, component, or process to meet desired needs within realistic constraints such as economics, environmental, social, political, ethical, health, and safety, manufacturability, and sustainability	
D	An ability to function on multi-disciplinary teams.	
E	An ability to identify, formulate, and solve engineering problems	e_1 e_2 e_3
F	An understanding of professional and ethical responsibility	
G	An ability to communicate effectively	
H	The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and social content	
I	A recognition of the need for, and an ability to engage in life-long learning.	
J	A knowledge of contemporary issues within and outside the electrical engineering profession.	
k	An ability to use the techniques, skills, and modern engineering tools necessary for electrical engineering practice.	