

EENG 232 - Electromagnetics I

Department:

Electrical and Electronic Engineering

Program Name:

Electrical and Electronic Engineering

Program Code: 27**Course Number:**

EENG 232

Credits:

4

 Required Course Elective Course**Prerequisite(s):**

MATH 152 and PHYS 102

Catalog Description:

Review of vector calculus. Electrostatics in vacuum. Coulomb's and Gauss's laws. Electrostatic potential. Poisson's and Laplace's equations. Conductors in the presence of electrostatic fields. Method of images. Dielectrics; polarization. Dielectric boundary conditions. Capacitance. Electrostatic forces by the virtual work principle. Steady currents. Ohm's and Joule's laws. Resistance calculations. Magnetostatics in vacuum. Ampere's force law. Biot-Savart law. Magnetic vector potential, Ampere's circuital law. Magnetic boundary conditions. Magnetic dipole. Magnetization. Magnetic circuits. Hysteresis curve. Self and mutual inductance. Magnetic stored energy. Magnetic forces by the virtual work principle.

Course Web Page:[Opencourses.emu.edu.tr/ Electromagnetics 1](http://Opencourses.emu.edu.tr/Electromagnetics_1)**Textbook(s):**

1) Elements of Electromagnetics, Matthew N.O.Sadiku, Oxford University Press, 2007

Indicative Basic Reading List :

1. Fundamentals of Engineering Electromagnetics, David K. Cheng, Addison Wesley, 1993
2. Engineering Electromagnetics, William H. Hayt, McGraw-Hill
3. Electromagnetics, John D. Kraus and Keith R. Carver, McGraw-Hill
4. Electromagnetics, Schaums Outline Series, McGraw-Hill

Course Outline:

- Week 1: **Course Registration Period**
Course objectives, course description,
- Week 2 -3: Vector Analysis
- Vector algebra
- Orthogonal coordinate systems
- Gradient
- Divergence, divergence theorem
- Curl, Stokes' theorem
- Helmholtz theorem
- Week 4-8: **Static Electric Fields:**
- Coulomb's Law
- Electric Field Intensity
- Gauss' Law
- Electric potential
- Conductors and Dielectrics
- Polarization and flux density vectors
- Boundary conditions
- Capacitance, electrostatic energy and forces.
- Week 9-10: **Mid-Term Examination**
- Week 11: **Static Electric Fields: (continued)**
- Poisson's and Laplace's equations
- Method of images
- Week 12: **Steady Electric Currents:**
- Current density and Ohm's law

<p>Week 13-14: . Static Magnetic Fields:</p> <ul style="list-style-type: none"> - Power dissipation and Joule's law - Boundary conditions for current density calculations - Ampere's force law - Definition of magnetic flux density vector - Biot-Savart law - Magnetic vector potential - Ampere's circuital law - Magnetic dipole - Magnetization and the magnetic field intensity vector - Boundary conditions - Magnetic energy, forces and torque <p>Week 15: Final Examination</p>

<p>Course Learning Outcomes:</p> <p>1) On successful completion of this course, all students will have developed knowledge understanding of:</p> <ul style="list-style-type: none"> (a) Coulomb's and Gauss's laws, (b) Electrostatic potential, (c) Poisson's and Laplace's equations, (d) Conductors in the presence of electrostatic fields, (e) Method of images, (f) Dielectrics, polarization, dielectric boundary conditions, (g) Capacitance, (h) Electrostatic forces by the virtual work principle, (i) Ohm's and Joule's laws, resistance calculations. (j) Ampere's force law. Biot-Savart law, (k) Magnetic vector potential, (l) Ampere's circuital law, (m) Magnetic dipole, magnetization, magnetic boundary conditions, Hysteresis curve, (n) Self and mutual inductance, (o) Magnetic stored energy, (p) Magnetic forces by the virtual work principle. <p>2) On successful completion of this course, all students will have developed their appreciation of and respect for values and attitudes regarding, carrying out directed private study using textbooks and other provided resources.</p>			
<p>Class Schedule: 4 hrs of lectures per week</p>		<p>Tutorial Schedule: 1 hr of tutorial per week</p>	
Assessment	Method	No	Percentage
	Midterm Exam(s)	1	35%
	Quiz(s)	3-4	10%
	Homework(s)	3-4	10%
	Final Examination	1	45%
<p>Contribution of Course to Criterion 5 Credit Hours for:</p> <p>Mathematics & Basic Science : 0 Engineering Design : 4 General Education : 0</p>			

Relationship of Course to Program Outcomes

The course has been designed to contribute to the following program outcomes:

- (a) An ability to apply knowledge of mathematics, science, and engineering
- (e) An ability to identify, formulate and solve engineering problems

Prepared by: Rasime Uygurođlu

Date Prepared: 20/02/2017