Catalogue description
This course covers the fundamentals of applied electromagnetics by emphasizing physical understanding and practical applications in Electrical and Computer Engineering systems. It deals with the study of static electric fields in vacuum and dielectrics, conductors, capacitance, electrostatic energy and forces, Poisson’s equation, static magnetic fields, Biot-Savart law, Ampere’s law, vector magnetic potential, inductance, Maxwell’s equations for time varying fields, Faraday’s law, waves and phasors, time-harmonic fields. The bridge between electric circuits and electromagnetics is done through the study of transmission lines and their lumped-element model, transmission line input impedance, and power flow on lossless transmission line.

Required or Elective
Required for EE and CCE

Prerequisites
By courses: Math 201 and Math 202.

By topic: Electricity and magnetism. Vector algebra and Vector Calculus. Differential Equations

Textbook(s) and/or required materials

Course objectives
1. An introduction to the general field of electromagnetism.
2. An understanding of basic electromagnetic concepts and parameters necessary for the analysis and design of electromagnetic systems.
3. Mathematical skills relevant to electromagnetic systems.
4. Basic analysis techniques needed when formulating and solving electromagnetic problems.
5. A broad outlook and appreciation of the contribution of electromagnetics to the fields of electrical, computer, and communication engineering.
6. The technical foundation required for more advanced future courses in applied electromagnetics engineering.
7. An understanding of how to bridge between the concepts of electric circuits and the concepts of electromagnetics as presented.

Course Outlines


5. **Plane-wave Propagation:** Review of Waves and Phasors. Time-Harmonic Fields


**Course outcomes**

1. Are knowledgeable in static electric and magnetic fields.
2. Demonstrate an ability to apply Gauss’ law, Ampere’s Law, Biot-Savart law, Faraday’s law and Maxwell’s equations in the analysis of electromagnetic systems.
3. Are familiar with the different vector operators used in Maxwells’ equations and plane wave analysis.
4. Are familiar with the four Maxwell’s equations used to study time-varying EM or dynamic fields.
5. Are familiar with Lenz’s law and the concept of induced emf, force and torque
6. Are able to apply Electromagnetics boundary conditions to solve for fields at interface between different mediums.
7. Understand the voltage and current wave equations along a transmission line.
8. Understand the concepts of incident and reflected waves, reflection coefficient, and Standing-Wave Ratio along a transmission line.
9. Have been exposed to some electromagnetic system applications.

**Resources of the course**

Textbook, problem solving sessions, lecture notes, Moodle

**Course Assessment:**

Three Lectures/week, two quizzes, and a Final Exam.

**Professional Components**

Engineering topics: 90%
General education: 0%
Mathematics and basic sciences: 10%

**Person(s) who prepared this description and date of preparation**

Riad Chedid, February 2013