EE 330 - Engineering Electromagnetics

Designation: Required core course for electrical engineering majors.

University Bulletin Description: Static electric and magnetic fields, solutions to static field problems, Maxwell's equations, electromagnetic waves, boundary conditions; engineering applications. Prerequisites: E E 210, MATH 230.

Prerequisites by Topic:

1. Electrical circuit analysis
2. Three-dimensional analytic geometry
3. Vectors in space
4. Partial differentiation
5. Integral vector calculus

Textbook: F. T. Ulaby, *Fundamentals of Applied Electromagnetics*, Pearson Prentice Hall, 5rd Edition, 2007.

Course objectives:
This course provides electrical engineering students with an understanding of fundamental electricity and magnetism concepts and enables them to use these concepts in applications. Upon successful completion of this course students will

1. be able to use complex number algebra and complex vectors,
2. be able to interchange time-domain and frequency-domain views of a problem,
3. understand the coupling between electric and magnetic fields through Maxwell's equations,
4. understand constitutive parameters and boundary conditions and be able to analyze the relationships between fields and flux densities in material media,
5. be able to analyze electromagnetic waves in material media, and the reflection and transmission of these waves between different media
6. be able to interpret the energy and power associated with electromagnetic fields,
7. be able to analyze and design basic transmission lines and waveguides,
8. be able to analyze and assess antennas and radiation from antennas.

Topics:

1. Introduction and Transmission Lines (11 classes)
2. Vector Analysis (8 classes)
3. Electrostatics (8 classes)
4. Magnetostatics (4 classes)
5. Maxwell's Equations (4 classes)
6. Plane Wave Propagation (8 classes)
7. Reflection, Transmission and Waveguides (8 classes)
8. Radiation and Antennas(8 classes)

Class/Laboratory Schedule: Three 50-minute lectures and one 75-minute recitation per week.

Computer Usage: There are four software laboratory assignments utilizing MATLAB and focusing on transmission lines, electrostatics, magnetostatics, and wave propagation.

Contribution to Meeting the Requirements of Criterion 5. Curriculum:
This course contributes to the engineering topics component.

Relationship to program outcomes:

O.1.1. Graduates will possess mathematics skills necessary for electrical engineering.
O.1.2. Graduates will have a theoretical and practical background in both physics and chemistry.
O.1.3. Graduates will have attained computer proficiency.
O.2.4. Graduates will understand fundamental electricity and magnetism concepts and be able to use them in applications.
O.4.2. Graduates will develop an appreciation of continuing educational and professional development.
O.6. Graduates will appreciate their role as engineers in society.

Prepared by: Kultegin Aydin **Date:** May 1, 2008