ECE 332 Fields and Waves (Electromagnetics)

Required for Electrical and Computer Engineering Students

Catalog Data

ECE 332 Fields and Waves (Electromagnetics 5 Credits)

This course focuses on the fundamentals of electromagnetics. Students are expected to acquire expertise in vector analysis, electrostatic and magnetic fields, Maxwell's equations, plane waves, reflection, attenuation, and impedance. Knowledge of circuit theory, Matlab, differential equations, and calculus are required to successfully complete the course.

Required Textbook

None

Recommended Textbook

- "Fundamentals of Applied Electromagnetics (6th Edition)", Fawwaz T. Ulaby, Eric Michielssen, and Umberto Ravaioli, ISBN: 0132139316.
- "Schaum's Outline of Electromagnetics, (3rd Edition)", (Schaum's Outline Series) ISBN: 0071632352.
- "Electromagnetics, (1st Edition)", Branislav M. Notaros, ISBN: 0132433842.
- "Engineering Electromagnetics, (8th Edition)", William H. Hayt, John A. Buck, ISBN: 0073380660.

Coordinators

Hani Mehrpouyan and Lori Hazlip

Relationship to Student Outcomes

This course relates to student outcomes EAC a. b, and e.

Student Learning Outcomes, Students will

1. Apply vector calculus to analyze simple electrostatic and magnetostatic fields and are able to perform calculations involving various differential operators as well as line and surface integrals relating to Gauss, divergence, and Stokes Theorems (EAC a).
2. Carry out experiments that investigate the basic concepts of "capacitance" and "inductance", and approaches for their measurement and calculation through the application of modern engineering measurement tools (EAC b).
3. Describe the coupling or interaction amongst time-varying electric and magnetic fields and the resulting Maxwell equations, and are able to apply them to simple problems (EAC e).
4. Describe the major parameters and electromagnetic quantities involved in transmission line theory such as wave characteristics, impedance, impedance matching and, transformation, standing wave ratio, reflection and transmission coefficients, etc. and usage of Smith charts (EAC e).

Prerequisite by topic

- Differential and integration calculus
- Vector Calculus
- Freshman level electricity and magnetics
- Algebra
- Trigonometry

Lecture Topics

This one-quarter first course is aimed at providing a firm foundation in Engineering Electromagnetics to both specialist and non-specialists undergraduates.

Class Schedule

Meets for 5 hours of lecture and 2:30 hours of laboratory exercises each week for 10 weeks.

Computer Usage

Matlab.

Laboratory Projects

1. Electric Fields calculation.
2. Electric field calculation part II.
3. Capacitance.
4. Magnetic Fields.
5. Inductance.
6. DC motor and antenna characteristics.

Professional Component

Contributes toward the Electrical Engineering Topic Courses.

Design Content Description

- *Approach*: The design component is provided through lecture materials, laboratory exercises, homework, and tests.
- *Lectures:* 80%
- *Labs:* 20%

Grading Criteria

- *Homework:* 15%.
- *Labs:* 20%.
- *Midterm I:* 15%.
- *Midterm II:* 15%.
- *Final Exam:* 35%.

Estimated ABET Category Content

Mathematics and Basic Sciences: 0.0 Credit Units
Computing: 0.0 Credit Units
Engineering Topics: 4.0 Credit Units
Engineering Sciences: 3.0 Credit Units
Engineering Design: 1.0 Credit Units

Prepared by

Hani Mehrpouyan

Approved by

Approved by CEE/CS Department on December 2012.