ENEE 380 Electromagnetic Theory Spring 2009

Course description:

Prerequisites: MATH 241 and PHYS 263 and completion all lower-division technical courses in the EE curriculum.

Introduction to electromagnetic fields. Coulomb's law, Gauss's law, electrical potential, dielectric materials capacitance, boundary value problems, Biot-Savart law, Ampere's law, Lorentz force equation, magnetic materials, magnetic inductance, time varying fields and Maxwell's equations.

Lectures: TuTh 3:30- 4:45 CHEM 2136

Instructor: Edward Ott

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Office Hours: W 10:30-11:30 or by appointment.

Web Page: http://www.ece.umd.edu/class/enee380-2

T.A.: Diego Castro-Hernandez. Email: dcastro@umd.edu;
Office phone: (301) 405- 6560
Office hours: Tues. 1:30-3:30, Eng. Annex, Rm. 305, and by appointment.

Recitation: Recitations start Feb. 6.
Section 0201: Fri 12:00, EGR 3102
Section 0202: Fri. 1:00, EGR 3102.

Method of Grading:
March 12: First Examination (closed book) 25 %

April 30: Second Examination (closed book) 25%

May 20, Wednesday 10:30-12:30: Final Examination (closed book) 40%; 8:00-10:00 same classroom.

There will be about 11 homeworks during the semester. Homeworks will count for 10% of the grade. Homeworks will be collected on due date in the Tuesday lecture class. Graded homeworks and solutions will be handed out in the recitation class.

Makeup examinations will only be given provided sufficient justification is presented *as soon as it is available.*

Textbook: David K. Cheng, Field and Wave Electromagnetics, Second Edition, Addison Wesley.

References:

- William H. Hayt, Engineering Electromagnetics.
- Simon Ramo, John R. Whinnery, Theodore Van Duzer, Fields and Waves in Communication Electronics.

Course Objectives:

1. Understand Maxwell's equations
2. Understand electromagnetic fields, charges, currents
3. Apply 3-dimensional vector calculus to electromagnetic fields
4. Calculate electromagnetic field distributions
5. Understand field concept underlying common electrical components (inductors, transistors)

Course Synopsis:

1. Vector analysis review (pp. 11-71)
2. Coulomb's law and electric field (pp. 72-87)
3. Gauss's law and applications (pp. 87-92)
4. Electric potential (pp. 92-100)
5. Conductors and dielectrics in static electric fields (pp. 100-109)
6. Electric flux density and dielectric constant (pp. 109-116)
7. Boundary conditions for electrostatic fields (pp. 116-121)
8. Capacitance and capacitors (pp. 121-133)
9. Electrostatic energy and forces (pp. 133-143)
10. Poisson's and Laplace's equations and uniqueness (pp 152-159)
11. Method of images (pp. 159-174)
12. Boundary-value problems (pp. 174-192)
13. Current density and Ohm's law (pp. 198-205)
14. Kirchhoff's voltage and current laws (pp. 205-210)
15. Joule's law, boundary conditions, resistance (pp. 210-219)
16. Magnetostatics in free space (pp. 226-232)
17. Vector magnetic potential, Biot-Savart law (pp. 232-239)
18. Magnetic dipole, magnetization (pp. 230-248)
19. Magnetic field intensity, magnetic circuits (pp. 248-256)
20. Magnetic materials, boundary conditions, inductance (pp. 257-277)
21. Magnetic energy, magnetic forces, torque (pp 277-294)
22. Time varying fields and Maxwell's equations introduction

Academic Integrity: In this class outright copying on homework will be considered academic dishonesty; however, discussing homework problems with other members of the class is permissible and encouraged.