COLORADO STATE UNIVERSITY
DEPARTMENT OF ELECTRICAL AND COMPUTER ENGINEERING

ECE 341 – *Electromagnetic Fields I*, Fall 2009

COURSE SYLLABUS

(1) Course Details:

Instructor: **BRANISLAV M. NOTAROS**, Associate Professor, Eng C101C, Phone: (970) 491-3537
E-mail: notaros@colostate.edu, Web: www.engr.colostate.edu/~notaros

Class Meetings: Tuesday, Thursday 12:30pm-1:45pm, Nat Res 113

Office Hours: Tuesday 11:00am-12:00noon and 2:00pm-2:30pm, Thursday 11:00am-12:00noon and 2:00pm-2:30pm, or by appointment

Textbook: - N. N. Rao, "Elements of Engineering Electromagnetics," 6th Edition, Prentice Hall, 2004.
- Additional notes, examples, problems, etc. provided by the instructor.

Class Web page: http://www.engr.colostate.edu/ECE341/FA09/course_info.shtml

Teaching Assistant: **Nada Sekeljic**, Applied Electromagnetics Lab (Engineering B110), inadasek@engr.colostate.edu, (970) 491-2967

Class Recitations with TA:

- Monday, from 5:00pm to 7:00pm, in Engineering B 2 --- every week.
- Thursday, from 5:00pm to 7:00pm, in Forestry 107 --- every week.

For your convenience, the TA will be doing the same sets of problems in Mon and Thu sessions.

(2) Course Description:

Fundamentals of time-invariant electric and magnetic fields and time-varying electromagnetic fields governed by Maxwell's equations. Topics include the electromagnetic model, vector calculus, electrostatic fields, steady electric currents, magnetostatic fields, electromagnetic induction, slowly time-varying electromagnetic fields, and Maxwell's equations in integral and differential form. Solutions of Maxwell's equations in the presence of boundary conditions are presented. Electromagnetic energy and power, and electromagnetic potentials are studied. Circuit theory and its relationship to electromagnetics is presented as an approximate form of Maxwell's equations.

(3) Evaluation of Students and Grading Policy:

- Homework and projects (~10%)
- Exam 1 (~20%)
- Exam 2 (~20%)
- Exam 3 (~20%)
- Final Exam (~30%)

(4) Organization of Course Topics:

	No.of Weeks (tentative)
1. Electric and magnetic fields in free space (Chapter 1)	3
2. Maxwell's equations in integral form (Chapter 2)	4
3. Maxwell's equations in differential form, Energy and power (Chapter 3)	2
4. Fields and waves in material media (Chapter 4)	2
5. Electromagnetic potentials, Electromagnetic devices and systems (Chapter 5)	4

(5) Exams:

- Exam 1 – Thursday, October 1, 2009, in class
- Exam 2 – Tuesday, November 3, 2009, in class
- Exam 3 – Thursday, December 3, 2009, in class
- Final Exam – see the Fall 2009 Final Exam Schedule on the CSU web

All exams are closed book, closed notes. No calculators are allowed. One sheet with formulas (prepared by the student) is allowed per each partial exam, and two sheets for the final exam.

(6) Homework:

- Homework will be assigned weekly, on every Friday morning (by 10:00am). Homework assignments will be posted on the T drive, in T:\classes\ECE\ECE341\drop-box\Assignments. The file names will be self-explanatory (for example, ECE341_Fall2009_HW1_assignment.PDF for Homework 1).
- Homework will be due the following Friday at 10:00am, in the ECE341 drop box in the BC infil in the Engineering building. Late homework is not allowed and will not be collected.
- The solutions to homework problems will be posted on the T drive, in T:\classes\ECE\ECE341\drop-box\Solutions (for example, ECE341_Fall2009_HW1_solutions.PDF for solutions to Homework 1).
- Graded homework will be available by the following Thursday at 3pm. It can be seen and picked up from the TA during her office hours.
- In cases of any exceptions to this schedule, students will be notified in class and/or by email.

(7) Course Objectives/Outcomes:
Please also see the ECE341 IO Diagram

The objectives of the course are for the students to develop an understanding of electromagnetic-field fundamentals by emphasizing both mathematical analytical rigor and physical conceptual reasoning, as applied toward practical engineering problems. Students learn to analyze engineering systems based on electrostatic fields, steady electric currents, and magneto static fields in arbitrary material media, and to apply vector calculus to solve a large variety of static field problems. Students develop a solid grasp and true appreciation of Maxwell's equations and use these equations to solve time-varying field problems. By the end of this course, students should be able to:

1. Appreciate fields.
2. Solve realistic electromagnetic-field problems utilizing physical conceptual reasoning and mathematical synthesis of solutions, and not pure formulaic solving.
3. Understand electric and magnetic properties of material media and how these properties can be exploited in engineering applications.

4. Visualize electric and magnetic fields and understand associated abstract field phenomena.
5. Utilize three-dimensional vector differential and integral concepts to solve real-life electromagnetic-field problems.
6. Understand fundamentals of energy and power, and electromagnetic potentials.
7. Appreciate fundamental laws and work of pioneering giants of electromagnetics, their historical perspective in the development of science and engineering and current relevance in cutting-edge engineering applications.
8. Mathematically model electromagnetic-field physical structures and processes.
9. Geometrically represent and spatially visualize realistic three-dimensional devices and systems.
10. Appreciate electromagnetic field theory as a foundation of circuit theory and electrical engineering as a whole.
11. Understand limitations of circuit theory as an approximation of field theory.