COLORADO STATE UNIVERSITY
DEPARTMENT OF ELECTRICAL AND COMPUTER ENGINEERING

ECE 580B5 – *Applied Electromagnetics*, Fall 2017

COURSE SYLLABUS (tentative)

(1) Course Details:

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

Class Meetings: Tuesday, Thursday 12:30–1:45 pm, ENGRG B3

Office Hours: Tuesday 11:00am–12:00noon, Thursday 11:00am–12:00noon, or by appointment

Textbook: Required: TBD
Optional: *Electromagnetics*, Branislav M. Notaros, PEARSON Prentice Hall, 2010
- Lecture notes provided by the instructor.

(2) Course Description:

High- and low-frequency electromagnetics, wave propagation, radiation, and scattering, wireless and guided-wave systems, bioelectromagnetics

This ECE graduate electromagnetics course provides students with advanced electromagnetics concepts and in-depth understanding and analytical skills in applied engineering electromagnetics to effectively solve complex practical electromagnetic problems. It also enables students to identify interesting and important research topics for M.S and Ph.D. work. The course serves students in electromagnetics, RF, radar, remote sensing, lasers and optics, circuits, communication, systems, and power areas.

(3) Specific Course Topics/Units/Weekly Schedule (tentative):

1. Maxwell's equations in integral and differential forms, Boundary conditions, Materials
2. Electromagnetic potentials, High- and low- frequency electromagnetics, Limitations of circuit theory
3. Impressed sources, Energy and Power, Generalized Poynting's theorem for any materials and sources
4. Equivalent electric and magnetic currents, Electromagnetic field theorems, applications
5. Static electric and magnetic fields, applications
6. Quasistatic electromagnetic fields, applications
7. Electric circuits at high frequencies, EM issues in high-speed electronics, EM compatibility, EM interference
8. Boundary-value problems, Analytical techniques for electromagnetic fields and waves
9. Wave equations, Propagation, Wave reflection and refraction for arbitrary boundaries, Multilayer media
10. Guided wave electromagnetics, Modal analysis of waveguides
11. Frequency-domain analysis of multi-conductor transmission lines
12. Transient analysis of multi-conductor transmission lines

13. Electromagnetic radiation, Principles of operation of basic classes of antennas for wireless communication
14. Electromagnetic scattering, Rayleigh scattering, Mie solution, high-frequency scattering
15. Bioelectromagnetics, biomedical applications of EM fields and waves at RF and microwave frequencies

(4) Evaluation of Students and Grading Policy:

- Homework and projects (40%)
- Midterm Exam (30%)
- Final Exam (30%)

Grades will be assigned from A+ through F, including plus and minus categories (no C-, D+, and D-), according to the following grading rubric:
$97 \leq x \leq 100$ A+; $93 \leq x < 97$ A; $90 \leq x < 93$ A-; $87 \leq x < 90$ B+; $83 \leq x < 87$ B; $80 \leq x < 83$ B-; $77 \leq x < 80$ C+; $70 \leq x < 77$ C; $60 \leq x < 70$ D; $x < 60$ F;

(5) Academic Integrity Policy:

- This course will adhere to the CSU Academic Integrity Policy as found in the General Catalog (http://www.catalog.colostate.edu/FrontPDF/1.6POLICIES1112f.pdf) and the Student Conduct Code (http://www.conflictresolution.colostate.edu/conduct-code). At a minimum, violations will result in a grading penalty in this course and a report to the Office of Conflict Resolution and Student Conduct Services.

(6) Course Learning Objectives:

1. Analyze and evaluate low-frequency electromagnetic fields
2. Analyze and evaluate high-frequency electromagnetic fields
3. Analyze and evaluate electromagnetic propagation, radiation, and scattering
4. Analyze, evaluate, and design wireless and guided electromagnetic wave systems