ELEC 211 / MATH 264: Engineering Electromagnetics with Vector Calculus

Time and Place (January 2016 offering):

Section 201: T/Th, 10:00 – 11:30 am in WOOD 4	Section 202: T/Th, 2:00 – 3:30 pm in MCLD 202

Instructors:

Carol Jaeger Department of Electrical and Computer Eng. KAIS 5024 carolj@ece.ubc.ca office hours by appointment	Philip Loewen Department of Mathematics Math Building room 207 loew@math.ubc.ca office hours posted at www.math.ubc.ca/~loew

Textbooks (required):

Engineering Electromagnetics, 8/e, by William H. Hayt, Jr., and John A. Buck. New York: McGraw Hill, 2012.	*Multivariable Calculus*, 7/e, by James Stewart. Belmont, CA: Brooks/Cole, 2012.

Grading Scheme: Students will get the same scores in ELEC 211 and MATH 264, calculated using

Quizzes	(4 @ 10% each)	40%
Online Homework	(about 10 in total)	10%
Final Exam		50%

About the course:

This course is a complete integration of ELEC 211 and MATH 264. Lectures topics are interwoven such that mathematical concepts are taught at appropriate times to support and illuminate the electromagnetics topics. The course builds on what you have learned in firist-year physics (PHYS 157/8/9 or PHYS 153), but adds the framework of vector calculus – a key ingredient in taking the study of electromagnetics to the next level.

Most of this course deals with static problems (situations not changing with time), though towards the end some slowly time-varying phenomena will be introduced. The material contained in this course is fundamental to nearly all areas of electrical engineering.

This course is taught in a blended format. Weekly pre-class activities will be posted on Connect on Friday mornings. These could take the form of readings, videos, or practice exercises. In class, there will be some formal lecturing, but also some group problem solving. Weekly assignments will be assigned using WebWork. Assignments will be based on the material from the week just past. Pre-week prep will be used to help set up the lectures for the week that follows.

Weekly activities:

Fridays	Tuesdays	Thursdays
Assignment released (12:01 am)	*Pre-week prep due (8:00 am)*	*Assignment due (11:59 pm)*
Pre-week prep released (12:01 am)	Class	Class

Learning goals:

By the end of this course you should be able to:

- Work comfortably with vector quantities, and perform a variety of mathematical operations with them
- Set up and evaluate line, surface, and volume integrals in various coordinate systems
- Translate electromagnetic situations into mathematical equations (and then solve them)
- Solve problems based on the Divergence Theorem and Stokes's Theorem
- Solve for the force on charged structures in the presence of electric fields
- Solve for the electric field at a point due to a variety of charge distributions
- Find electric field and flux distributions, given a static charge distribution, using Gauss's Law
- Calculate changes in electric and magnetic fields at boundaries between materials
- Evaluate the capacitance or inductance of a variety of structures
- Find the magnetic field resulting from a given current distribution, using Ampere's law
- Describe the different types of magnetic materials
- Calculate the displacement current in simple circuits
- Explain the principles of operation of a variety of electromagnetic devices
- Create simplified mathematical models for devices that use electromagnetic principles in their operation
- Analyze the behavior of a variety of conducting structures in the presence of a time-varying magnetic field
- Understand and apply Maxwell's equations

Academic Integrity:

The scholarly community is founded on honesty, civility, and integrity. As members of this community, all students are expected to know, understand, and follow the codes of conduct regarding academic integrity. At the most basic level, this means submitting only original work done by you and acknowledging all sources of information or ideas and attributing them to others as required. This also means you should not cheat, copy, or mislead others about what is your work. Violations of academic integrity (i.e., misconduct) lead to the breakdown of the academic enterprise, and therefore serious consequences arise and strict sanctions are imposed. For example, incidences of plagiarism or cheating may result in a mark of zero on the assignment or exam . More serious consequences may apply if the matter is referred to the President's Advisory Committee on Student Discipline. Careful records are kept in order to monitor and prevent recurrences.
UBC Academic Calendar entry: http://www.calendar.ubc.ca/vancouver/index.cfm?tree=3,286,0,0