ELEC 211 / MATH 264: Engineering Electromagnetics with Integrated Vector Calculus

Time and Place (January 2019 offering)

Lecture Section 201: Tues. 11 – 12:30 in MCLD 228 Thurs. 11 – 12:30 in MCLD 202	Lecture Section 202: Tues. 2 - 3:30pm in MCLD 228 Thurs. 2 - 3:30pm in MCLD 228
Tutorial: Alternate Mondays starting January 7, 5 – 6:30pm, WOOD 2 (both sections)	

Instructors

Carol Jaeger Department of Electrical and Computer Eng. KAIS 5024 carolj@ece.ubc.ca Open office hours Mondays at noon in KAIS 3046, or by appointment (please email with requests)	**Seckin Demirbas** Department of Mathematics Math Building room 235 s.demirbas@math.ubc.ca Office hours: please see http://www.math.ubc.ca/~s.demirbas/current.html

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 1st 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.

The majority of this course is dedicated to static problems (things not changing with time), though towards the end some slowly time-varying phenomena will be introduced. The material contained in this course is key to the further study of nearly all areas of electrical engineering.

Grading Scheme

Quizzes	4 @ 10% each	40%
Homework	Best N-2, where N ≅12	10%
Bonus points*	*only unlocked if combined average of quizzes and final is above 50%	5%
Final Exam	Single comprehensive exam covering material from both courses	50%

Quiz Dates

January 21; February 4; March 4; March 18, during the common tutorial period.

Resources

We will rely on materials provided on Canvas and open source textbooks for reference. Please see Canvas for a list of suggested references.

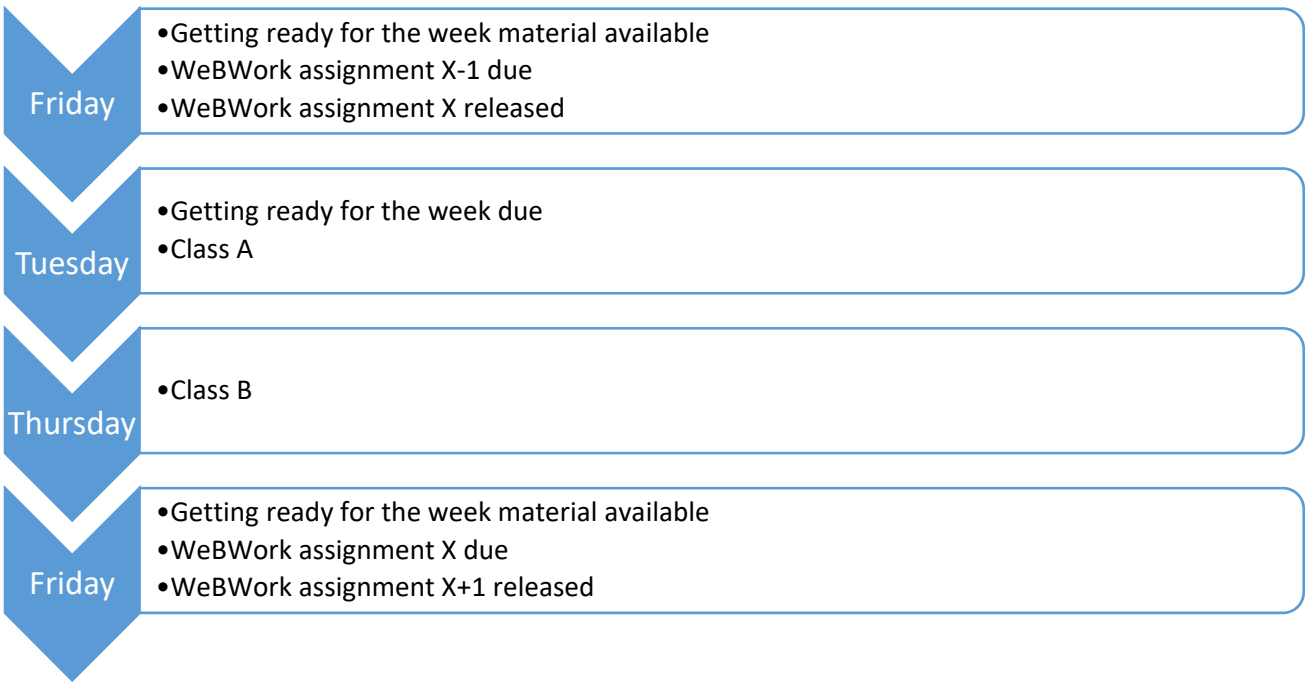
Learning goals

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

- Work comfortably with vector quantities, and perform a variety of mathematical operations with same
- Solve line, surface, and volume integrals in multiple coordinate systems
- Convert word problems to mathematical equations (and then solve them)
- Apply Divergence and Stokes' theorems correctly in problem solving
- 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
- Apply Gauss' law in the solution of electric field distributions resulting from charge distributions
- Use boundary conditions to determine the effect of different materials on electric and magnetic fields
- Evaluate the capacitance or inductance of a variety of structures
- Apply Ampere's law in the solution of magnetic field distributions resulting from current distributions
- Describe the different types of magnetic materials
- Calculate the displacement current in simple circuits
- Explain the principal of operation of a variety of electromagnetic devices
- Analyze the behavior of a variety of conducting structures in the presence of a time-varying magnetic field
- Understand and apply Maxwell's equations

Weekly schedule

This course is taught in a blended format. In class, there will be some formal lecturing, but also some group problem solving. Some lecture notes will often be released before class, but these should not be considered the full content – attending class is critical. Each week there will be some materials to review prior to coming to the lectures. Weekly assignments will be released on the WebWork platform (available through the Canvas site. Assignments will be based on the material from the week that has just been completed. A typical schedule will be as follows:



Course Policies

Pre-requisites: The pre-requisites for this integrated pair of courses are: One of MATH 263, MATH 253 and one of PHYS 102, PHYS 153, PHYS 158 or APSC 178. These are hard pre-requisites, and if you have not successfully completed these or equivalent courses, you will not be permitted to remain registered in the course. If you have equivalent courses not listed here (e.g. transfer credit from other institutions), kindly bring this to the attention of your instructors via email.

Homework: Weekly assignments will be released on the WebWorK platform every Friday, and will be due on the following Friday at 11:59 pm. If there are a total of N WebWorK assignments, the best N-2 will count towards your final grade. The homework questions will be related to the material covered in the lectures for that week. In other words, we will cover material before assigning homework problems.

Quizzes: Each quiz will start at 5:15pm and will last for 75 minutes. Formula pages will be provided. Allowed materials are pens, pencils, ruler, eraser, and a non-programmable calculator (e.g. Sharp EL-510)

Missed Quizzes: If you miss one quiz and have medical documentation to support your absence, the weight of that missed test may be transferred to the final exam. If you miss more than one quiz, please make an appointment to discuss the situation with an instructor.

Final Exam: The final exam will be a comprehensive exam covering the full course. It is scheduled centrally by UBC and we have no control over the exam date.

Bonus Points: Up to 5 bonus points may be available during the term, but will only be applied to your final grade if you have a passing average on the combination of the quizzes and the final exam. These points may be awarded for GRFTW participation, class participation, bonus questions on tests, or other positive contributions to the class at the instructor's discretion.

Centre for Accessibility: If you are registered with the Centre and require academic accommodations for test writing, it is your responsibility to register the quiz dates with the Centre with sufficient notice for them to accommodate your needs. The course instructors are unable to provide custom accommodations for students during the published quiz times.

Academic Integrity

The academic enterprise is founded on honesty, civility, and integrity. As members of this enterprise, 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 harsh sanctions are imposed. For example, incidences of plagiarism or cheating may result in a mark of zero on the assignment or exam and 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