UBC-Vancouver Mathematics 264

Vector Calculus for Electrical Engineering

Overview. This is a unique one-credit course offered in tandem with EECE 261, Engineering Electromagnetics. Officially, the MATH topics are, "Divergence, gradient, curl, and the theorems of Gauss and Stokes; Applications to Electrostatics and Magnetostatics." Meanwhile, the EECE topics are, "Electrostatics, electric currents, dielectrics, capacitance, electrostatic potential, magnetostatics." In practice, the courses are a tightly coupled package in which instructors collaborate to help students master all these topics.

Learning Goals for MATH 264. By the end of this course, the students should be able to ...

- Set up and evaluate line integrals that represent total charge on a curve in space or total work done by a given force along a given path. (Evaluation should be done using appropriate methods: inspection and symmetry where applicable, detailed calculation otherwise.)
- Set up and evaluate surface integrals that represent total charge on a patch of area in space, or electric flux through a given surface. (Evaluation should be done using appropriate methods: inspection and symmetry where applicable, detailed calculation otherwise.)
- Recognize when a given vector field can be expressed as a gradient, and find all antiderivatives in such cases.
- Apply the Divergence Theorem to problems involving flux through a surface.
- Apply Stokes's Theorem to problems involving line integrals.
- Articulate an interpretation for each of the mathematical operations described above in terms of electricity and/or magnetism.

Textbook. One of the following:

– James Stewart, *Multivariable Calculus,* 7/e. Thompson Learning, 2012.

– James Stewart, *Calculus: Early Transcendentals*, 7/e. Thompson Learning, 2012.

(The first-named volume is a selection of chapters from the second.)

Evaluation. MATH 264/EECE 261 is so tightly coupled that each student's grade in MATH 264 will be the same as that student's grade in the companion course EECE 261.

More Information. Details of the grading scheme, syllabus, and schedule are on the course's Connect site: see `http://elearning.ubc.ca/connect/`.

Instructor Information. In Jan–Feb 2013, the first block of MATH 264 will be delivered by Professor Loewen. Office hours are by appointment in room MATH 207. Email `loew@math.ubc.ca` to book a meeting.

In Feb–Mar 2013, the second block of MATH 264 will be delivered by Dr Zwiers, email `zwiers@math.ubc.ca`.