

MATH 221 — Vector Calculus

Fall 2008

Instructor	Farida Enikeeva Jeffery Hall, 208, phone 5332441 email: farida@mast.queensu.ca
Office Hours	Monday, 15:30-17:00, or by appointment
Course Website	http://www.mast.queensu.ca/~math221
Lectures	Slot 13: Monday 13:30, Wednesday 12:30, and Friday 11:30, Stirling Hall, B
Textbook	There is no official textbook for this course but the lectures will follow the book <i>Calculus</i> by Hughes-Hallett et al (4th edition). The third edition of this book and any recent edition (5th or 6th) of Stewart's <i>Calculus: Early Transcendentals</i> are equally good.
Prerequisites	The prerequisites are some knowledge of (1) integration of functions of one variable, (2) differentiation of functions of one, two or more variables, (3) addition, scalar multiplication, and dot and cross product of vectors, and (4) understanding the graphs of some simple equations of three variables (like $z = x^2 + y^2$, $x^2 + y^2 = 1$ and $x^2 + y^2 + z^2 = 1$).
Midterm Tests	Unless otherwise announced, the dates for the in-class tests will be as follows: Friday, October 10 and Monday, November 10.
Evaluation	The evaluation in MATH-221 will be based on two in-class tests and a final examination. The course grade in MATH-221 will be calculated as follows: in-class tests (15 marks each) and the final examination (70 marks). You will find all your marks on the WebCT website for this course. No calculators, books, data sheets, or other aids will be allowed on the in-class tests or on the final examination.
Course outline	This course is a natural continuation of MATH-121. The course covers the following topics: double and triple integrals, parametrized curves, vector fields and their divergence and curl, line integrals, path-independence of line integrals and Greens formula, oriented surfaces, flux integrals, Stoke's and Gauss formulas, and some applications of these formulas.

Tentative schedule

- **Week 1.** Double integrals (16.1-16.2)
- **Week 2.** Double integrals in polar coordinates, triple integrals (16.3-16.4)
- **Week 3.** Triple integrals in spherical and cylindrical coordinates; applications of integration to probability; Parametrized curves (16.5-16.6, 17.1)
- **Week 4.** Parametrized curves; motion, velocity, acceleration; vector fields (17.1-17.3)
- **Week 5.** Gradient fields; level curves (Section 17.3). Midterm test 1 on Multiple Integrals, Parametrization, and Vector Fields
- **Week 6.** The idea of line integral; line integral over parametrized curves (18.1-18.2)
- **Week 7.** Fundamental Theorem of Calculus for line integrals; path-independent and gradient field; circulation; Green's Theorem (18.3-18.4)
- **Week 8.** The curl test; the idea of flux integral; parametrized surfaces (19.1, 17.5)
- **Week 9.** Flux integrals for graphs, cylinders, and spheres (19.2)
- **Week 10.** Midterm test 2 on Line Integrals and Flux Integrals. The divergence of a vector field, divergence-free vector fields (20.1)
- **Week 11.** The Divergence Theorem; the curl of a vector field; Stoke's Theorem (20.2-20.4)
- **Week 12.** Curl free vector fields; the three fundamental theorems; review (20.4-20.5)