MATH 251 Multivariable Calculus
Section 0301 Spring 2012

- Instructor: Dr. Jinglai Shen
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- Lectures: Tue and Thu, 4:00–5:50 pm, at MP 101
- Office hours: Tue and Thu, 3:00–4:00 pm or by appointment
- Course web-page: http://www.math.umbc.edu/~shenj
- Prerequisites: Math 152 (Calculus II) with a grade C or better; the material in Math 151 (Calculus I) is also important
- Text: *Multivariable Calculus* by James Stewart, 6th Edition, Thomson Brooks/Cole, 2008.
- **Tentative exam dates**:
  - Exam I: Tue, Feb. 28 (in class)
  - Exam II: Thu, Mar. 29 (in class)
  - Exam III: Thu, Apr. 26 (in class)
  - Final Exam: Tue, May 15

  These dates are subject to change.

Course Description The course of *Multivariable Calculus*, also known as Calculus III, deals with the calculus (e.g. differentiation and integration) of functions of several variables and functions in higher-dimensional spaces. It is an extension of the calculus of single-variable, real-valued functions treated in Calculus I and II. The course starts from vectors and vector-valued functions, and then treats differentiation and integration of multivariable functions with applications to optimization, physics and geometry, with a final exposition on vector calculus. The class emphasizes concepts and computation, as well as geometric understanding of computational results. The basic notions and techniques in this class find broad applications in applied math, physics, engineering, and social sciences.

Objectives One should learn the following aspects from this course: vector algebra, vector functions and their geometric interpretation, partial and directional derivatives of multivariable functions, optimization using derivatives and Lagrange multipliers, multiple integrals in different coordinate systems with applications to computation of area, volume, and surface area, line integrals, Green's Theorem, and Stokes' Theorem.

Homework Weekly homework will be assigned. Homework is usually collected in class on Tuesdays unless a due date change is announced. No late homework will be accepted. Please present your answers neatly and show all your work.

Exams There will be three (3) in-class mid-term exams, and one (1) final exam (see the tentative dates on Page 1). Each mid-term exam mainly focuses on topics covered in that month, but the final exam will be comprehensive. Please be aware that (i) there will be *no* optional final exam; and (ii) calculators and other computing devices are *not* allowed for mid-term exams and final exam.

Grading Policy The grading scheme is as follows:

- homework: 15%
- mid-term exams: 60% (20% for each)
- final exam: 25% (the final is comprehensive)

The letter grade will be computed based upon the numerical grade:

$A : \geq 90; \quad B : 89 - 80; \quad C : 79 - 65; \quad D : 64 - 50; \quad F :< 50$

Academic Integrity

- The UMBC Academic Integrity Statement:

  "*By enrolling in this course, each student assumes the responsibilities of an active participant in UMBC's scholarly community in which everyone's academic work and behavior are held to the highest standards of honesty. Cheating, fabrication, plagiarism, and helping others to commit these acts are all forms of academic dishonesty, and they are wrong. Academic misconduct could result in disciplinary action that may include, but is not limited to, suspension or dismissal. To read the full Student Academic Conduct Policy, consult the UMBC Student Handbook, the Faculty Handbook, or the UMBC Policies section of the UMBC Directory [or for graduate courses, the Graduate School website]*".

- All work in a homework or an exam must be your own; collaborating on a test is *not* permitted. Discussions with other students on homework problems are allowed, but you should present your own work in the final turn-in; simply copying other people's work is a violation of UMBC's academic integrity code.
- If you wish to contest a graded exam, you must make an appeal within *one week* of the return date to the class. If you must miss an exam due to a prior obligation, you must speak to the instructor *in advance* of the exam. If you must miss an exam due to an unforseen but valid reason (e.g. illness), you must submit a written excuse. Failing to do so may result in loss of substantial points off the top in your make-up.

Some Suggestions This course contains a vast number of topics that will be covered in a relatively fast pace, ranging from basic operations for vectors and vector functions to a variety of differentiation and integration techniques for multivariable functions in different coordinate systems. Here are a few suggestions that will help you grasp materials efficiently:

- Read the scheduled materials before going to class. If you have difficulty in understanding some concepts or results, bring them to the class.
- Review notes and the textbook before doing homework. Though discussions are allowed for homework problems, try your best to solve them with your own effort.
- If you have already done your best but sill have questions about materials, either see the instructor at office hours or get helps from other sources right away.

Tentative Schedule and Topics (the topics and dates are subject to change)

No.	Week	Topic	Section (Stewart)
1	Jan. 23-Jan. 27	Introduction, coordinate systems, vectors	12.1-12.2
2	Jan. 30–Feb. 3	Dot product, cross product	12.3-12.4
3	Feb. 6–Feb. 10	Lines and planes, quadric surfaces	12.5-12.6
4	Feb. 13–Feb. 17	Vector funcs, calculus of vector funcs	13.1-13.2
5	Feb. 20–Feb. 24	Arch length and curvature, Multivariable funcs, limits & continuity	13.3, 14.1-14.2
6	Feb. 27–Mar. 2	Exam I, partial derivatives	14.3
7	Mar. 5–Mar. 9	Tangent planes and linear approx., Chain rule, directional derivatives	14.4, 14.5-14.6
8	Mar. 12–Mar. 16	Optimization, Lagrange multipliers	14.7-14.8
9	Mar. 19–Mar. 23	Spring break (no class)	
10	Mar. 26–Mar. 30	Double integrals I, Exam II	15.1
11	Apr. 2–Apr. 6	Iterated integrals, double integrals II	15.2-15.3
12	Apr. 9–Apr. 13	Double integrals in polar coordinates, Triple integrals I	15.4 15.6-15.7
13	Apr. 16–Apr. 20	Triple integrals II, vector fields	15.7-15.8, 16.1
14	Apr. 23–Apr. 27	Line integrals, Exam III	16.2
15	Apr. 30–May 4	FTC for line integrals, Green's Theorem, Curl and divergence	16.3-16.4, 16.5
16	May 7–May 11	Surface integrals, Stokes' Thm, review	16.6-16.7