Math 2415, Fall 2012
Calculus of Several Variables

Course Information

84572 Math 2415.001 TuTh 10:00-11:15 am ECSS 2.312

Professor Contact Information

Instructor: Dr. Minkoff

Office: FO 2.402B

Email: sminkoff@utdallas.edu

Webpage: I will maintain a web page for the course, linked from my web page http://www.utdallas.edu/~sminkoff. (I do *not* use eLearning.)

Phone: TBD (Email greatly preferred.)

Office Hours: TuTh 11:15-12 noon *and by appointment.*

Course Pre-requisites and Co-requisites

Pre-requisites: A grade of C- or better in MATH 2414 or equivalent

Preparation: In general, success in Math courses strongly depends on your grade in previous relevant courses. *For Math 2415, the material in Math 2413 (Calculus I) is much more important than that in Math 2414 (Calculus II).*

Co-requisites: Students *must* be enrolled in one of the following problem sessions:

84870	Math 2415.301	M 9:00-10:50	CB3 1.302
84872	Math 2415.303	M 11:00-12:50	CB3 1.302
84874	Math 2415.305	M 1:00-2:50	CB3 1.302
85583	Math 2415.307	M 3:00-4:50	CB3 1.310
85585	Math 2415.309	W 9:00-10:50	CB3 1.308
85587	Math 2415.311	W 11:00-12:50	CB3 1.302
85589	Math 2415.313	W 1:00-2:50	CB3 1.308
85591	Math 2415.315	W 3:00-4:50	CB3 1.308

Students *must* be enrolled in one of the following exam sections (see below for exams dates):

84869 Math 2415.701 F 2:00-4:45 SLC 2.303 or CN 1.120

Course Description

Continuation of the Math 2413, 2414 sequence. The course covers differential and integral calculus of functions of several variables. Topics include vector valued and scalar functions, partial derivatives, directional derivatives, chain rule, Lagrange multipliers, multiple integrals, double and triple integrals, the line integral, Green's theorem, Stokes' theorem, Divergence theorem.

Required Textbooks and Materials

Text: "Calculus (Early Transcendentals)", Seventh Edition, by James Stewart, Chapters 12-16; A less expensive Electronic Version is also available.

Material Covered: The course will cover the following sections of the textbook: 12.1-12.6, 13.1-13.3, 14.1, 14.3-14.8, 15.1-15.4, 15.7-15.10, 16.1-16.9.

Academic Calendar and Assignments

The Course Schedule and Homework Assignments are available on my web page.

Grading Policy

Participation in Problem Sessions	5%
Homework	15%
Midterm 1	25%
Midterm 2	25%
Final Exam	30%
Total	100%

Participation: The Teaching Assistant will give you a grade between 0 and 5 depending on the degree to which you *actively* participate in small group learning experiences in the Problem Sessions.

Homework: Your lowest two homework grades will be dropped.

Midterm Exams: There will be two midterm exams, each two hours.

- Midterm 1: Friday Oct. 5th, from 2:00-4:00, on 12.1-12.6, parts of 15.7 and 15.8, 13.1-13.3 (excluding curvature), 14.1, 14.3, and 14.4.
- Midterm 2: Friday Nov. 9th, from 2:00-4:00, on 14.5-14.8, part of 16.6, 15.1-15.4, 15.10, 16.1, 16.2.

Final Exam: Friday Dec. 14th, from 2:00-4:30. The final will be based on the whole course and will be 2 hours 30 mins.

Instructor Policies

Homework: There will be one homework assignment due every week on Thursday. Homework is to be turned in at the START of class on Thursday or can be slipped under my office door *prior* to class on Thursday if you must miss class for some reason. *Late homework will not be accepted.*

The grader will check that all homework assigned has been done, but will only carefully grade selected problems. Please note that the homework constitutes a substantial portion of your overall grade. In order to learn the concepts and be able to apply them to solving problems on exams, etc., you are strongly encouraged to devote as much time as possible to working the homework problems. I encourage you to discuss the homework assignments with other students in the class. However, I expect the homework you submit for grading to be written up by you alone.

Calculators: You are allowed to use calculators and software tools such as Mathematica, Maple, and Matlab on your homework assignments. However, since the exams are designed to test your *understanding* of the underlying concepts covered in this class, *calculators will not be permitted (or necessary) for use in the exams.*

Email: I am happy to answer questions about the class via email. However, it is much better for you if we can talk in my office at the board. Answers given over email will be brief and intended merely to answer your direct question rather than to explain concepts. I reserve the right not to respond to email if I feel it would be best for the student to discuss his/her question in person during my office hours. I will not respond to email which does not include the name of the sender.

Tests: No make-up exams will be given except *possibly* in the case of a serious emergency. In such a case I *must* be notified *in advance*. There will be no exceptions to taking the final exam at the date, time, and place specified by the University. The final exam will be comprehensive although material covered after the second midterm will be emphasized.

Attendance: I expect students to attend class and to turn up **on time**. Rarely do students do well in classes which they do not attend, and I will be less likely to give outside assistance to students who regularly

miss class. Further, students arriving late for class disrupt the entire class. Students who consistently turn up more than a few minutes late for class or who regularly miss class may be docked points from their final grade. Students should also note that I do not allow cell phones, laptops or other electronic devices to be used in class and will ask that these items be turned off at the start of class.

Integrity: I take academic dishonesty *very seriously* and will not tolerate it in this class in any form. Academic misconduct includes willfully cheating on or giving aid during an exam or copying homework assignments (from the web, from each other, or from a solutions manual). Blatant copying on an exam, homework assignment, or computer assignment will result in a grade of zero for that work. Further information on the academic conduct policy can be found at http://www.utdallas.edu/deanofstudents/dishonesty/

UT Dallas Syllabus Policies and Procedures

The information at http://go.utdallas.edu/syllabus-policies constitutes the University's policy and procedures segment of the course syllabus.

The descriptions and timelines contained in this syllabus are subject to change at the discretion of the Professor.

Student Learning Objectives/Outcomes

Multivariable or Vector Calculus is an undergraduate course that generalizes the concepts you learned in first and second semester Calculus to higher dimensions. Specifically you will learn what it means to integrate and differentiate functions that have domains or ranges not in $\Re$ but in $\Re^n$. These concepts form the basis for a huge field of mathematics – the study of partial differential equations (pde's). PDE's are equations that model most of the interesting physical phenomena encountered in science and engineering (just a few examples include the propagation of light and sound waves through the air or earth, the flow of fluids in a reservoir or aquifer, etc). It is essential that you master the concepts in this course in order to be able to deal with models found in the physical world (we live in three space dimensions).

Specifically, in this course you will:

1. Review vector arithmetic learning how to add and multiply vectors.

2. Because it is rare that one can solve equations found in the real world exactly, approximate solutions usually suffice. The concept of distance is essential in many engineering studies in which one needs to know how accurate an approximate solution is, and

hence, being able to measure distances between vectors is a fundamental concept in this course.

3. You will learn how to describe some basic surfaces (planes, cones, cylinders, etc) which will be used as motivating examples on which to integrate and differentiate functions later. And you will learn different ways to describe the same surface or object.

4. We will explore the concepts of velocity and acceleration that arise with vector-valued functions.

5. In first semester calculus you defined both the derivative and integral in terms of limiting processes (as some quantity went to infinity). In higher dimensions the idea of approaching "from both sides" becomes more complex. You can approach a point along an infinite number of directions in two dimensional space. Hence you will learn what it means to take derivatives, find limits, and approximate functions that have multiple arguments (ie, the domain of the function is no longer just the real line).

6. You will discover how to optimize functions that depend on several variables both when the function to be optimized has constrained resources and when the function is unconstrained.

7. You will learn how to integrate functions over domains that live in higher dimensions (ie, are not just intervals of the real line).

8. And you will learn basic physical rules that relate the integral of a function on the interior of a domain to the value of the function on the boundary (ie, higher dimensional generalizations of the Fundamental Theorem of Calculus).

Tips for Succeeding in this Class:

1. The textbook is intended to *supplement* in class lectures (and vice versa) so if you attend class but do not read the appropriate section in the book you will miss out on a wealth of good information and on an alternate view of the material. The text is an invaluable resource as it acts as a second teacher and as a reference point when topics are unclear. However, I will not test you on material in the text which I don't also cover in class.

2. Before you attempt the homework you should *read the sections* in the book which explain the concepts covered in the homework.

3. You will benefit greatly from working with others in the class so long as you use your peers as a way to hash over concepts and not a way to "get the answers". In other words, *start early* and use your fellow-classmates to discuss the best way to approach the problems. Then go off and try to work out the details yourself.

4. **Begin the new homework assignment the same day you turn in the previous assignment!** Do not wait 3–4 days to start the homework as then you will not have enough time to digest the material or understand the point of the problems.

5. Come to office hours and get help if you are stuck. It is much better to get help early than to wait. I may ask you to show me what you've come up with at the board so you should have at least attempted the homework problems before asking for help.

Important Dates:

Date	Notes
8/27/12	First day of class
9/4/12	Last day to add course
9/12/12	Last day to drop class (without "W" on transcript)
10/5/12	Midterm Exam 1
10/30/12	**Absolute Last day to drop class**
11/9/12	Midterm Exam 2
12/12/12	Last day of classes
12/14/12	Final Exam