

**Course:** Multivariate Calculus  
MATH 221A  
Spring 2002  
MT TF 9:00 Thompson 318

Instructor: Martin Jackson  
Office: Thompson 325  
Phone: 879-3567  
E-mail: martinj

### Course Overview and Text

This course is the third in the three semester calculus sequence. Our goals for this course are

- to understand the relevant concepts of calculus;
- to develop facility with the computational techniques of calculus;
- to explore applications of calculus;
- to gain proficiency in reading and writing mathematical exposition; and
- to sharpen critical thinking and logical reasoning skills.

The central theme of this course is extending the basic concepts of calculus to higher dimensions. In the first two semesters of the calculus sequence, the primary objects of interest are functions for which each input is a single real number and each output is also a single real number. Multivariate calculus concerns functions for which each input or output can be an ordered pair or triple of real numbers.

It is often useful to think of each ordered pair or triple as a **vector** so this course begins with a study of vectors from both algebraic and geometric viewpoints. We then study the calculus of **vector-output functions**. Geometrically, a vector-output function describes a curve in the plane or in space.

The text for this course is *Calculus*, 2nd ed., Gerald L. Bradley and Karl J. Smith, (Prentice-Hall, 1999). We will cover the material in Chapters 9 through 14 of the text.

### Course Web Page

A web site for this course is located at

[www.math.ups.edu/~martinj/courses/spring2002/m221/m221.html](http://www.math.ups.edu/~martinj/courses/spring2002/m221/m221.html)

or go to [www.math.ups.edu/~martinj](http://www.math.ups.edu/~martinj) and follow the obvious links. Assignments will be listed and class handouts will be available to download as PDF files. Scores for assignments and exams will be posted by codeword for those who wish. If you want your scores to be posted, send me an e-mail to tell me the codeword you want to use.

### Grading, Coursework, and Policies

In class, we will discuss new material, respond to questions from reading the text, and work through assigned problems on which there are difficulties. When we discuss new material, the focus will be on “the big picture.” That is, we will look at new ideas in their simplest form and how these ideas fit together. Often, we will not consider details and variations in depth during a first pass through new material.

Your mastery of the details will begin outside of class with a careful reading of the text and work on the assigned problems. We will address the details by responding to questions on the reading and problems that you bring to class. You are expected to participate in class by being present (and alert), by responding to questions I pose, and by asking the questions that you have.

Outside of class, you should read the relevant sections of the text carefully. This will generally include working through the reasoning of arguments and filling in steps that are omitted in calculations. You should keep a list of specific questions from the reading and find answers to those questions either in class, with me outside of class, with study partners, or with a tutor.

The text is also a source of problems that are essential in building understanding and skill. I will assign homework problems from the textbook on which I expect you to spend considerable time and effort. For most sections we cover, I will also designate several problems to be collected and evaluated. You should not get in the habit of focusing only on the problems designated to be turned in. You will need to do many more problems in order to become facile with the concepts, techniques, and applications.

A project will be assigned on a take-home basis almost every week. The purpose of the projects is to present challenges, often open-ended, that go beyond the routine of problems and to provide practice in technical writing. For each project, you will compose a complete write-up. This should be done in complete sentences with enough detail for a reader to follow your reasoning and reconstruct your work. All graphs should be done on graph paper or with appropriate computer assistance. I encourage you to work on these projects in small groups. If you do work on a project with others, you must do your own write up of the results.

Each problem set and project will have a due date. If you wish to turn an assignment in after the due date, you must talk with me before the due date. Under reasonable circumstances, I will grant individual extensions for deadlines. If you submit an assignment after a deadline (or an agreed upon extension), I will assess a penalty equal to 10% of the assignment's maximum point value for each working day that the assignment is late.

In order to assess your learning, we will have five exams and a final exam. The date for each of the five exams during the semester will be announced at least one week in advance. In order that time not be a factor on exams, I will arrange to give each exam during a two-hour time period, generally in the evening. I write exams so that approximately three-fourths of each exam is "straightforward" and the remainder involves more challenging problems. By this, I intend that a well-prepared student can do the "straightforward" problems without hesitation but will often or always have to struggle with the challenging problems.

The final exam will be comprehensive. It is scheduled for 12:00-2:00 pm on Wednesday, May 15. It is University policy that no exceptions can be made for taking a final exam at the scheduled time. Please do not make travel arrangements

that conflict with the scheduled final exam time.

To determine course grades, I calculate a total course score according to the following weights:

1. Homework	20%
2. Projects	30%
3. Exams	40%
4. Final exam	10%

I assign a preliminary course grade based on an objective standard (93.3-100% for an A, 90.0-93.2% for an A-, 86.7-89.9% for a B+, 83.3-86.7% for a B, etc.). I then look at each student's performance subjectively. Occasionally I will assign a course grade that is higher than the objective standard. For example, if a student has a grade of B according to the objective standard but has shown steady improvement, I might assign a course grade of B+.

### **Office Hours**

I am available in my office for help several hours each day. I am often in my office during the day in hours at which I do not have a scheduled class, meeting, or other activity. A copy of my schedule is included below. Feel free to come look for me. To be (almost) guaranteed that I will be in, come during one of the hours labeled as an "office hour." You can also call, send e-mail, or stop me after class to schedule an appointment for a specific time.