

**Instructor:** Peter Webb  
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**Course Site:** <http://www.math.umn.edu/~webb>  
**Office Hours:** 11:15-12:05 MWF or by appointment.  
**TA:** John Goes, 524 Vincent Hall, 624-2084, [johngoes@math.umn.edu](mailto:johngoes@math.umn.edu)  
**Text:** J.H. Hubbard and B.B. Hubbard. Vector Calculus, Linear Algebra, and Differential Forms, 4th edition.

### Course Content

This course is a continuation of Math 3592 taught in the Fall semester, and we will study material from Section 2.10 and Chapters 3, 4, 5 and 6 of the book by Hubbard and Hubbard. Part of what we study will have to do with integrals and part with derivatives. We start with the implicit and inverse function theorems from Section 2.10, which we will do without proof. We go on to say what a manifold is at the start of Chapter 3 and then go on to use derivatives to find maxima and minima of functions. We will introduce multiple integrals on regions of space in Chapter 4 and use them to compute volumes of manifolds in Chapter 5. In Chapter 6 we put all this together and study integrals of differential forms. The main theorem in Chapter 6 is the theorem of Stokes, which has as particular cases theorems of Gauss and Green, and may be regarded as the extension to arbitrary dimensions of the fundamental theorem of calculus. Familiarity with multiple integrals and the theorems which relate to them is essential in working with the differential equations of Physics.

In terms of mathematical sophistication this course falls between the other undergraduate courses on multivariable calculus (for example, the IT Honors course) and the graduate level course 'Manifolds and Topology'. We will work with differential forms (not done in other undergraduate courses) but be less complete than the graduate treatment.

It may appear that we have a large part of the book to cover this semester, although in fact the number of pages in Chapters 3 - 6 is not that much more than the number of pages in Chapters 0 - 2. Nevertheless we will need to get through the pages faster than we did in the first semester. I propose to do this in part by omitting certain sections. For instance, in Chapter 4 I anticipate that we will only study sections 0, 1, 5, 8, 9, and 10.

### Course Assessment

There will be three full-period mid-term exams, to be held on **Thursday February 21**, **Thursday March 28** and **Thursday May 2**. The final exam will be at **1:30-4:30 Monday May 13** (see [http://onestop.umn.edu/calendars/final\\_exams/common.html](http://onestop.umn.edu/calendars/final_exams/common.html)) The final exam will probably not be held in our usual classroom. You will also have homework and quizzes organized by the TA in recitations. Your final grade will be made up of homework and quizzes 20%, mid-term exams 15% each, final exam 35%.

### Homework

Assignments will usually be handed out on Monday or Wednesday. Some of the problems are to be handed in on Thursday of the following week at the beginning of your recitation period (10 or

8 days after it is assigned). Late homework will receive a very reduced grade (no credit for problems already solved in class). If it is handed in after the assignment has been graded, there will be no credit given.

### **Quizzes**

There will be a short quiz at the beginning of most of the Thursday recitation periods covering homework due that day. The first quiz will be on **Thursday January 31**.

### **Absence from exams**

Missing a midterm is permitted only for the most compelling reasons. Except in extraordinary situations, you should obtain permission from the **professor** to miss an exam in advance; otherwise you will be awarded a 0. If you are excused from taking a midterm, your course grade will be determined by giving extra weight to the final exam. No make-up exams or quizzes will be given. Except in extremely exceptional situations, all students missing the final exam will fail the course. Don't bother to obtain permission to miss a quiz: your lowest quiz score will be dropped.

### **Attendance**

Students are expected to attend all lectures and recitations. Attendance may be checked and included in the grade line.

### **Expectations of written work**

In a number of cases in the homework problems and the questions in the exams you will not get full credit if you simply write down the correct answer. To get full credit you will need to write an explanation of how you got your answer. Where explanations need to be given, these should be written out in sentences i.e. with verbs, capital letters at the beginning, periods at the end, etc. and not in an abbreviated form.

I encourage you to form study groups. However everything to be handed in must be written up in your own words. If two students hand in identical assignments, they will both receive no credit.

### **Computers and Calculators**

You are not required to have a calculator. Computers may not be used on quizzes and exams. Calculators will be allowed on some quizzes and exams, and you may use one if you like..

### **Incompletes**

These will only be given in exceptional circumstances. A student must have satisfactorily completed all but a small portion of the work in the course, have a compelling reason for the incomplete, and must make prior arrangements with the **professor** for how the incomplete will be removed, well before the end of the quarter.

### **Credits and Workload Expectations**

For undergraduate courses, one credit is defined as equivalent to an average of three hours of learning effort per week (over a full semester) necessary for an average student to achieve an average grade in the course. For example, a student taking a three credit course that meets for three hours a week should expect to spend an additional six hours a week on course work outside the classroom.

Date of this version of the schedule: 1/22/2013