Math 251H, Fall 2006
Multivariable Calculus

Instructor: John Zweck

Office: MP 424

Email: zweck@math.umbc.edu

Webpage: www.math.umbc.edu/∼zweck I will maintain a web page for the course, linked from my web page. I will also communicate with you using a class email list.

Phone: (410) 455 2424 (I rarely check my messages. Email me instead.)

Fax: (410) 455 1066

Lectures: MWF, 1:00pm- 2:05pm (MP 401)

Text: "Calculus", Fifth Edition, by James Stewart, Chapters 13-17

Resources:

1. "The Feynman Lectures on Physics, Volume II", by Feynman, Leighton, and Sands
2. "Vector Calculus" by Jerrold E. Marsden and Anthony Tromba
3. "A MATLAB Companion for Multivariable Calculus", by Jeffery Cooper

Prerequisite: Math 152 with a grade of C or better

Material Covered: In class we will cover 13.3-13.7, 14.1-14.3, 15.2-15.8, 16.1-16.4, 16.7-16.9, 17.1-17.9, and three lectures on Maxwell's equations loosely based on material from The Feynman Lectures and from Marsden and Tromba. I will provide notes for these lectures. **In addition, you will be responsible for mastering the material in 13.1, 13.2, and 15.1. (These are all easy sections.)**

Honors: This course differs from the standard version of Math 251 in that there will be some MATLAB-based homework, students will present solutions to homework at the board, and we will discuss the application of Multivariable Calculus to Maxwell's equations.

Learning Goals: For an overview of my approach to Math 251 see *Course Objectives for Teachers and Students of Math 251* on my main web page. The main learning goals I have for the course are that students master all the basic calculations required to apply Multivariable Calculus in science and math, and to gain an appreciation for the approach to the subject as outlined on the web page and discussed at length in class.

Office Hours: M 2:30-3:45, F 2:05-2:30 *and by appointment.* Other times I *may* be in my office: M 9-10, 12-1, W 10-1, 2:30-3:45, F 11-1. At these times I will typically have other appointments scheduled but if you have a

5-10 minutes question I may be able to help out. If you cannot come to my office hours *please* contact me in class or by email/phone to set up a time to meet. Also, you can ask me questions by email/phone.

Calculators: No calculators will be allowed on exams. Although you won't need to, you can use a scientific calculator for homework.

Tutoring: For additional tutoring help the Learning Resource Center operates the Mathlab (x 5-2444 for more details). Also, a list of private tutors will be posted in the Math Dept.

Academic Misconduct

I will not tolerate cheating in any form. Giving or receiving aid on exams or copying of homework will result in a grade of zero for the exam or homework. Here is a summary of UMBC's official policy on academic misconduct, which I fully endorse:

> 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*.

Grading

Grades: Homework 15%, Class Participation 5%, Midterm One 15%, Midterm Two 20%, Midterm Three 15%, Final 30%

Homework: There will be required and recommended homework problems posted on the course web page for each day of class. *Required problems* assigned on FMW will be due at the *start* of class the following **Wednesday**. At least some of them will be graded. Make sure your homework paper is *stapled*. *Recommended problems* will not be graded. However, since the only way to learn math is to do it, you are expected to do the recommended problems, and **some of them will appear on the exams!** *No late homework will be accepted!* Your lowest two homework grades will be dropped. You may ask me questions about the homework and you may collaborate with another student in the class. In fact you are encouraged to do so! However the final write up is your own – *two identical homework papers will both be given zero.*

Matlab Hwk: MATLAB is a mathematical software package that is very widely used in mathematics, science and engineering. It is on many UMBC computers. Among other things, MATLAB is very useful for visualizing curves and surfaces in space. I will assign homework problems from our text that can be done using MATLAB. I will also set up a short web page to help you get

started using MATLAB. I will provide some basic MATLAB programs that you can use to do the homework problems. This homework will simply be graded as part of your regular homework.

Class Participation: If all students agree, I would like to proceed as follows. On Monday and Wednesday straight after class between about 2:10 and 2:25 students will present previously graded homework problems at the board, and we will discuss the solutions together. Each day two students will present one problem each. Over the course of the semester each student will present a total of three problems at the blackboard. Your class participation grade will be based on your presentations.

Midterm Exams: There will be three midterm exams.

- Midterm 1: Wednesday September 27th, on Chapters 13-14.
- Midterm 2: Friday October 27th on Chapter 15.1-15.8, part of 17.6, and 16.1-16.4.
- Midterm 3: Wednesday November 22nd on Chapter 17.

Final Exam: Friday December 15th from 1-3pm in MP 401. The final will be based on the whole course. Some questions may be more difficult than those on the midterms.

How I assign final grades

For each exam I work out how many points I expect a student who has a solid understanding of the material to get. I tend to put the bottom B near this score. Then I work out where to place the bottom A,C,D using the grade distribution and by looking at individual exams. I also work out the bottom A,B,C,D for the homework. Then I take an imaginary student who got the bottom B (say) for each component of the course and calculate their score. If your score is higher than the imaginary student's you get a B. If it is a little less than the imaginary student's score I look carefully at your work to decide whether you deserve a B or a C. Most importantly I look at your final exam. Typically one or two students do much better on the final exam than on the other components of the course. If a student has a mid C grade going into the final but writes a mid to high B final I will probably give them a B for the course. *Also students who do very poorly on the final might find that their course grade is lower than they had expected!*

As you can see I place quite a bit of emphasis on the final exam. In short I reward "strong finishers" who can show me they have a solid understanding of the entire course.

Advice for Homework

1. If you get stuck on a problem get help and get it before you waste too much time!! Here are some places you can go for help.
   - Carefully read the book (again!).

- Ask me for help by email or in person.
- Ask a fellow class member – often two heads are better than one! I encourage you to find a study partner for this class. First attempt the hwk yourself, then discuss them with your study partner, and finally carefully write the solutions up in your own words.
- Sleep on it. Some of my best ideas come when I wake up in the morning.

2. My Dad used to say "You can't do maths on a postage stamp", so use lots of paper. Write your solutions up neatly *after* working out the problem on scrap paper. Apart from anything else, this helps you organize your thoughts and therefore learn the material better.

3. I'll teach you by example how to write up your solutions in a connected step-by-step fashion with explanatory sentences. You should aim to write up solutions so that you'll easily understand them in a month's time when you're studying for the exam!

4. Some of the homework problems will be harder than others. Don't expect to solve them all on the first try!

5. Never start your homework the day before it is due!!

6. You should spend *at least* 10-12 hours a week on this course outside of class time.

7. **If your homework grades are not as high as you'd like you should arrange to meet with me for 15 minutes at a fixed time each week. We will use this time to discuss what you did wrong on past homeworks and also check how you are doing on the current homework. Don't wait until exam time!**

Advice for Exams

Past Exams: I taught Math 251H in Fall 2003 and Math 251 in Spring and Fall 2004. At least some exams from those classes will be available on the web page for our class.
Types of Questions: The exams will test whether you have mastered the basic concepts and methods of calculation as well as whether you can apply your knowledge to solve problems. *You will not get any credit for an answer unless you also show how you arrived at that answer.* Some questions will be similar or even *identical* to homework and review questions. Others will look a little different from those you have seen before and will test whether you really understand the concepts we have discussed in class.

At least one question on each exam will involve *written explanations* of the *theory* we discuss in class. For example, I may ask you to explain some of the more important fundamental concepts, to carefully state some of the most important theorems, and to do *short* proofs of such results. *As we go through the material in class I will tell you which parts of the theory I may examine in this way.*
Review for exams: I will suggest practice problems before each exam. I will hold review sessions before each exam. If we have not fallen behind schedule, these will be in class on the class day before each exam. Otherwise, I will schedule reviews outside of the regular

class time.
Making up an exam you missed: If you miss one of the 3 midterms you *may* be given the chance to take a make up exam. To request a make up you should speak with me **no later than 48 hours after** the exam time. Generally speaking, you will be offered a make up if you are sick or if a close relative or friend is gravely injured/sick or dies. However I will listen to all reasonable requests. Be prepared to bring appropriate evidence in support of your request. There will be no make ups for the final exam.

How to succeed in the course

This is a very fast paced course and new material is always built on older material. In my opinion to succeed in the class you *must* do the following.

1. Read the results of a survey I did on *"Study Habits and the Transition from High School to UMBC"* which can be found on my web page and find a strategy that works for you.

2. Attend class every MWF. **Do not slack off on Fridays.** A study in the Math Dept at the University of Texas has shown that for every class a student misses their grade falls by about 10%.

3. *Turn up to class on time!*

4. If you do miss class contact me *asap* to find out how to catch up.

5. Begin each hwk assignment *the same day* that we cover the material in class. If you do this you will understand the next lecture much better!

6. Read each section of the book the day *before* we cover it in class.

7. I encourage you to *ask questions* both in and out of class. If you are dazed and confused most likely most of your class mates are too! So you'll be doing everyone a favor by asking your question.

8. In class I call on people by name to answer questions. This is to keep you involved and on your toes. It also helps me find out whether you are understanding what's going on. **If you do not feel comfortable being called on in class, please come and talk with me, and we will find another way to actively involve you.**

9. Come and talk with me in my office.

10. Learn the art of taking good notes.

11. Do *all* the hwk problems. Work out what your mistakes are on the graded hwk and learn from them.

12. Talk math with your fellow students, don't work in isolation.