Multivariate Calculus		Instructor:	Martin Jackson
MATH 280B		Office:	Thompson 602
Spring 2011		Phone:	879-3567
MTTF 10:00–10:50 Thompson 399		E-mail:	martinj@pugetsound.edu

Course Overview This course is the third in our three-semester calculus sequence. 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 (or, generally, n-tuple) of real numbers. In some contexts, we will find it useful to think of the inputs or outputs as *vectors*. Broad 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.

Class sessions In class, we will discuss new material, handle 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. I will often ask for ideas on how to proceed on a given problem or in developing a new concept. You should develop the habit of contributing ideas even if you are not confident your idea will work out.

Text The text for this course is *University Calculus*, Joel Hass, Maurice Weir, and George Thomas, (Pearson, 2007). We will cover material from Chapters 9 through 14. Outside of class, you should carefully read the relevant sections of the text. 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 in class, with me outside of class, with study partners, or with a tutor.

Homework 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. We'll begin most class sessions by addressing questions from assigned homework and reading. For most text sections, I will designate a homework problem or two to be submitted for grading. For full credit, the work you submit for these homework problems should be complete, clear, correct, and organized.

In doing homework problems, you should seek to go beyond mastering mechanical aspects (such as computational skills) to mastering concepts and ideas. For example, in doing homework problems, ask yourself "Do I understand the ideas and skills required to get a correct answer?" rather than merely "Did I get the correct answer?"

Projects Projects are a second type of assignment to be completed outside of class. The purpose of projects is to present challenges, often open-ended, that go beyond the routine of homework problems and to provide practice in technical writing. For each project, you will compose a written report. 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.

Due date policy Each problem set and project will have a due date. If you wish to turn an assignment in late, 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 extension we have agreed upon), I will assess a penalty equal to 10% of the assignment's maximum point value for each working day that the assignment is late.

Exams In order to assess your learning, we will have five exams. The date for each exam will be given at least one week in advance. The fifth exam will be during the final exam period scheduled for this course: 8–10 am on Monday, May 9.

I design 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. These problems may be similar to assigned homework problems. The more challenging problems will involve applying, generalizing, or synthesizing relevant ideas. For the challenging problems, I give some credit for identifying ideas that might reasonably be useful and for reasonable approachs even if not complete.

Course grades To determine your course grade, I will drop your lowest two homework problem scores and then calculate an overall homework percentage. If this homework percentage is greater than the lowest of your exam percentages, your lowest exam percentage will be replaced by the average of that percentage and your homework percentage. (If not, homework will play no direct role in your course grade.) I will then calculate a total course score with projects weighted at 15% and exams weighted at 85%. 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+, 83.3-86.6% 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+.

Computing technology You will often find it useful to have a calculator (or equivalent technology) with the following capabilities: function graphing, numerical equation solving, numerical differentiation, and numerical integration. Many brands have suitable models. I am most familiar with Texas Instrument calculators. Among Texas Instrument calculuators, the TI-83, TI-84, TI-86, and TI-89 models have appropriate features. Note that for some exams, I may forbid the use of symbolic computing features on calculators such as the TI-89.

Many graphing calculators are limited to two-dimensional plots. We will often want to look at three-dimensional plots and for these we will turn to other computing technology. Throughout the course, we will look at some options available for making three-dimensional plots.

Course web site A web site for this course is located at

`math.pugetsound.edu/~martinj/courses/spring2011/m280/m280.html`

(or go to `math.pugetsound.edu/~martinj` and follow the obvious links.) On the course web site, I will maintain a list of assignments and due dates along with a list of daily topics and relevent sections of the text. I will also post announcements and comments about questions or issues that come up in class. You should check the web site for new announcements several times each week. Class handouts distributed in class will be available to download as PDF files in case you lose your copy or miss class. Other handouts will be available only on the course web site.

Office hours and appointments I am generally 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. You can see my weekly schedule at

`math.pugetsound.edu/~martinj/schedule.html`

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.

	Monday	Tuesday	Wednesday	Thursday	Friday
8:00 am					
8:30 am					
9:00 am	Office Hour				Office Hour
9:30 am					
10:00 am	Math 280B TH 399	Math 280B TH 399		Math 280B TH 399	Math 280B TH 399
10:30 am					
11:00 am	Math 301A TH 374	Math 301A TH 374		Math 301A TH 374	Math 301A TH 374
11:30 am					
Noon	Exercise and Lunch	Lunch	Exercise and Lunch	Lunch	Exercise and Lunch
12:30 pm		Office Hour		Office Hour	
1:00 pm					
1:30 pm					
2:00 pm	FAC meeting		FAC meeting		Research meeting
2:30 pm					
3:00 pm					
3:30 pm					
4:00 pm	Departmental meeting or seminar			Math & Science Seminar	
4:30 pm					
5:00 pm					

Important dates for Spring 2011 Please note the following important dates:

Tuesday, January 25	Last day to add a course
Monday, January 31	Last day to drop a course without record
Monday, February 28	Last day to drop a course with an automatic W

Note that University policy mandates a grade of WF if you drop a course after Monday, February 28 unless "there have been exceptional circumstances beyond the student's control and the student's work has been of passing quality." For full details, see the Academic Handbook (available on-line).

Very tentative schedule

Monday	Tuesday	Thursday	Friday
Jan 17 MLK Day	Jan 18 **1**	Jan 20 **2**	Jan 21 **3**
Jan 24 **4**	Jan 25 **5** *Last day to add*	Jan 27 **6**	Jan 28 **7**
Jan 31 **8** *Last day to drop w/o record*	Feb 1 **9**	Feb 3 **10** Exam #1 (9:30-10:50)	Feb 4 **11**
Feb 7 **12**	Feb 8 **13**	Feb 10 **14**	Feb 11 **15** Writing exercise due
Feb 14 **16**	Feb 15 **17**	Feb 17 **18**	Feb 18 **19**
Feb 21 **20**	Feb 22 **21**	Feb 24 **22** Exam #2 (9:30-10:50)	Feb 25 **23**
Feb 28 **24** *Last day to drop w automatic W*	Mar 1 **25**	Mar 3 **26**	Mar 4 **27** Project #1 due
Mar 7 **28**	Mar 8 **29**	Mar 10 **30**	Mar 11 **31**
Mar 14 Spring Break	Mar 15 Spring Break	Mar 17 Spring Break	Mar 18 Spring Break
Mar 21 **32**	Mar 22 **33**	Mar 24 **34** Exam #3 (9:30-10:50)	Mar 25 **35**
Mar 28 **36**	Mar 29 **37**	Mar 31 **38**	Apr 1 **39** Project #2 due
Apr 4 **40**	Apr 5 **41**	Apr 7 **42**	Apr 8 **43**
Apr 11 **44**	Apr 12 **45**	Apr 14 **46** Exam #4 (9:30-10:50)	Apr 15 **47**
Apr 18 **48**	Apr 19 **49**	Apr 21 **50**	Apr 22 **51**
Apr 25 **52**	Apr 26 **53**	Apr 28 **54**	Apr 29 **55** Project #3 due
May 2 **56**	May 3 **57**	May 5 Reading Period	May 6 Reading Period

Exam #5: Monday, May 9, 8:00-10:00 am