MATH 200 MULTIVARIABLE CALCULUS, FALL 2018

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Textbook : Edwards and Penney, *Multivariable calculus* 6E.

Course Description: We will cover Chapters $12-15$ of the textbook. The topics roughly concentrate on multidimensional integration and differentiation, Lagrange multipliers and optimization, surfaces and Vector calculus. This essentially corresponds to the adaptation of the material in Calc I-II to the multi-dimensional case.
Workload: This course has a heavy worload! We cover a lot of foundational *new* material. Be prepared to work $10-15h$ per week. We recommend that you form study groups and regularly consult the Mathematical Resource Center.

Requirements/Grading: There will be weekly homework assignments, in-class quizzes, a midterm test, and a final exam. Your final grade will be computed as follows:

- Homework 10%
- Quizzes 20%
- Midterm 30%
- Final exam 40%

The midterm test will be 90 minutes long. The final exam will be 3 hours long and will be held during the finals period on 12/17 (at $9am$). The exact date/time/location of the other exams will be posted on the course webpage and announced in class as soon as it is available.

Homework problem sets are mostly from the textbook, and are due at the beginning of your recitation session. Late homework will not be accepted. Instead, the two lowest homework scores will be dropped. You are encouraged to discuss the homework with fellow students, but you should write up the assignments on your own. Write your name legibly, staple all pages together, write clearly in sentences, and circle your answers whenever appropriate.

The quizzes will be 30 minutes long. Aids such as books, notes, or calculators are not allowed. They will be held during recitation sessions (unless stated otherwise by your instructor), roughly every three weeks. If you miss a quiz for a legitimate and absolutely inevitable reason, you can make it up, but this has to be done ASAP. Under no circumstances will it be possible to makeup a quiz after it has been returned.

Date: Wednesday September 5th.

You should inform your instructor of any foreseeable conflict at least 1 week in advance. The time of the make-up should be cleared with your instructor beforehand.

You must be aware that this course will be quite fast paced and that you must not expect understanding it without some work, both during the class sessions and on your own. You are strongly recommended to make use of the office hours for any questions. You are also strongly encouraged to develop autonomy in your work. You should come to class having read the chapter before it is covered in class. This includes understanding the examples discussed in the chapters covered.

Main objectives: Listed below are some of the main topics and techniques you should learn from this class. We list each technical skill and offer an example of an application, but these techniques are versatile and apply in many different situations

- **Visualization**: You will be able to find different ways to represent functions of several variables. You should also be more familiar with parameterizing curves, surfaces and volumes.

  Functions are quantitative relationships between different variables. Surfaces allows to account for additional relations (constraints) in the variables.
- **Optimization**: You will be able to get basic methods to find a way to maximize/minimize a given number which depends on several parameters.

  This allows, once one to find the optimal prices to maximize a company's profits.
- **Study of curves**: You should be familiar with simple curves; you should be able to parameterize curves in spaces and to compute their velocity, acceleration, curvature, arclength.... You should also be able to study curves which are either given by an equation or solve basic ODEs.

  This allows to describe trajectories of various object. An application is the description of the motion of planets in the solar system.
- **Integration**: You should be able to integrate a given function depending on several variables.

  This allows you to compute different averages and probabilities.
- **Vector Calculus**: You should be familiar with various differential operators and their relations. You should be able to integrate on lines and surfaces and to us the variants of the Green Theorem.

  This is foundational for problems in mechanics. It also provides a nice application of all the material developed throughout the semester.

Tentative Course Outline

Week	Sections	Topics
1. Sep. 5 - 7th	12.1-12.3	Vectors.
2. Sep. 10th - 14th	12.4-12.6	Lines and curves.
3. Sep. 17th - 21st	12.8, 13.1-13.2	Spherical coordinates and functions of several variables.
4. Sep. 24th - 28th	13.3-13.5	Limits and partial derivatives. **Quiz 1**.
5. Oct. 1st - 5th	13.6-13.7	Linear approximation and the chain rule.
6. Oct. 10th - 12th	13.8-13.10	Gradient and Lagrange multipliers. Colombus Day on Monday
7. Oct. 15th - 19th	14.1-14.3	Double integrals, **Quiz 2**.
8. Oct. 22nd - 26th	14.4-14.6	Polar coordinates; applications of double integrals. **Midterm**
9. Oct. 29th - Nov. 2nd	14.7-14.9	Change of variable and surface area.
10. Nov. 5th - 9th	15.1-15.3	Vector fields and line integrals.
11. Nov. 12th - 16th	15.4-15.5	Green's theorem, surface integrals. **Quiz 3**.
12. Nov. 19th - 21st	15.6-15.7	Divergence theorem. Thanksgiving on Thursday
13. Nov. 26th - 30th	15.6-15.7	Stokes theorem
14. Dec. 3rd - 7th		Revisions
15. Dec. 8th - 14th		Reading period. **Quiz 4**.
16. Dec. 17th		**Final**.

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