Math 4320, Introduction to Real Analysis II
Spring 2008
Tuesday, Thursday 11:00 - 12:50

Instructor: Burt Simon
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Office: room 612 UCD Building
Office Hours: Tuesday & Thursday 1:00-3:00, Wednesday by appointment

- **Course Description**

  Text: Fitzpatrick, "Advanced Calculus", 2nd edition

  From the course catalog:
  Spring. Convergence, uniform convergence, Taylor's Theorem, calculus of several variables including continuity, differentiation and integration, Picard's theorem in ordinary differential equations and Fourier series. Prereq: Math 4310.

  Math 4320, Introduction to Real Analysis II, picks up where Math 4310 left off, and continues through Taylor series, sequences of functions, basic metric space topology, and calculus of multivariate functions.

  The classes will be lecture style, but questions and comments during class are encouraged. Homework assignments will be discussed in detail during class when they are due.

- **Assignments**

  Homework will be assigned approximately once per week – typically on Tuesdays – and will be due in class one week later. Students can email their solution to me in pdf or Word form (no fax's or scanned papers, please) *before* class on the day it's due if they cannot attend class. Students are expected to work on every assigned problem, although only one from each problem set will be graded (students' choice).

  Students can work in groups on the homework assignments, in which case they turn in one paper with all their names on it. Students in a group will all get the same grade on the paper they turn in.

- **Grading**

  The homework problems will each have point values – more points for harder problems. Students will choose *one* problem to be graded from each assignment. There will be partial credit given for partially correct solutions, but the best strategy for students will usually be to choose the hardest problem they knew how to do for grading. Confusing solutions (my call) will not receive full credit, even if some elements of a proper solution are present.

  There will also be an in-class midterm and final exam. For students that work alone on most of their homework assignments, the homeworks will count towards 50% of their grade, with the two exams worth 25% each. For students that usually work in a group, there will be a 33% split.

  I will give letter grades on the exams, and everything will be "averaged" and "curved" to obtain the grade for the course. Students that have clearly achieved the course objectives will get A's. Students receiving a B in the class are ready to move on to graduate level mathematics. Students receiving a C or below are not encouraged to immediately pursue graduate work in mathematics, although C and D grades signify that the student has learned something.

- **Course Policies**

  Late assignments will not be accepted except in very special cases. Even if you have completed only one problem out of the homework set, simply turn that one in as your chosen problem for grading. I will only attempt to read mathematical arguments that are in a nice pdf or Word format, unless there is a very compelling excuse.

  My policy on cheating and other unethical behavior will conform with university policies.

- **Course Objectives**

  1. Students will see how calculus and differential equations can be studied more rigorously than they were in lower-division courses. (Elemenary real analysis is often called "advanced calculus".)
  2. Students will be able to understand the proofs of the basic theorems of real analysis. Most of the proofs are of the "$\epsilon - \delta$" variety.
  3. Students will become proficient at constructing their own $\epsilon - \delta$ proofs, and presenting them (e.g., as a pdf or Word file) so that other analysts can follow their reasoning.

Tentitive schedule

1. Chapter 8, Approximation by Taylor Polynomials (2 weeks, 1/22 - 1/31)
2. Chapter 9, Sequences and Series of Functions (2 weeks, 2/5 - 2/14)
3. Chapter 10, The Euclidean Space $\Re^n$ (1 weeks, 2/19 - 2/21)
4. Chapter 11, Continuity, Compactness, and Connectedness (1 week, 2/26 - 2/28)
5. Chapter 12, Metric Spaces (2 weeks, 3/4 - 3/13)

   Midterm Exam on material in chapters 8-12, tentitively scheduled Thursday, 3/20
6. Chapter 13, Differentiating Functions of Several Variables (1 week, 3/25 - 3/27)
7. Chapter 14, Local Approximation of Real-Valued Functions (1 week, 4/1 - 4/10)
8. Chapter 15, Approximating Nonlinear Mappings by Linear Mappings (2 weeks, 4/15 - 4/24)
9. Chapter 16,17, Inverse Function Theorem and Implicit Function Theorem (2 weeks, 4/29 - 5/8)

   Final Exam focused on material in chapters 13-17, tentitively scheduled for Tuesday, 5/13