1. Material to be covered

This is a graduate course in Real Analysis. The principal topics to be covered include

1. Functions of Bounded Variation
2. Lebesgue Measure
3. Lebesgue Integral
4. Differentiation and Integration of functions of several variables
5. Lp Spaces and Functional Analysis

We shall cover much (but not all) of the material in the textbook Measure and Integral, R.L. Wheeden and A. Zygmund, Dekker Publishers, New York 1977, ISBN 0-8247-6499-4

As a text for additional reading, we suggest the elegant text


A note on Prerequisites: We welcome all qualified students, from whatever discipline, into the study of real analysis, but Math 6327 has firm prerequisites. The necessary background for this course is an undergraduate sequence in real analysis (at the level of Georgia Tech’s Math 4317-4318) and a firm grasp of linear algebra. Without these, a student will probably understand nothing of the material above, and may be at risk for an unfortunate grade. I will be happy to discuss your preparation with you if you need any help in evaluating your readiness for the class.

2. Lectures and Contact Information

Lectures will be in Skiles 240, from 1:05-1:55 on Mondays, Wednesdays, and Fridays. My office number is Skiles 134. Office hours (tentative) will be Mondays, Wednesdays and Fridays, from 3:00 - 4:00, or by appointment. My e-mail address is

 green@math.gatech.edu

My telephone number is 404-894-4312.

A lot of information for the course will be available on the web at various sites. Prof. Lubinsky, who is teaching another section of the same course this term, will post material at

www.math.gatech.edu/~lubinsky

You can also find lecture notes and other materials from Summer 2005 (when Prof. Heil and I taught the class) on my web site

http://www.math.gatech.edu/~green
Further posting for this section of the course will appear at this last site.

3. Tests and Assignments

Homework will be assigned periodically. A (proper) subset of each assignment will be graded either by me or by a grader (still to be appointed). You may consult with each other on the homework assignments, and you may ask questions about them, but you must write up and submit your own work.

There will be one midterm test and one final examination. A tentative date for the midterm test is

        Hour Test: Wednesday 5 October

4. Grading

These various items will be weighted according to the scheme

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<thead>
<tr>
<th>Item</th>
<th>Weight</th>
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<tbody>
<tr>
<td>Homework</td>
<td>30%</td>
</tr>
<tr>
<td>Midterm Test</td>
<td>30%</td>
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<tr>
<td>Final Exam</td>
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5. Honor Code

Please review the Georgia Tech Honor Code, which you can find at

http://www.deanofstudents.gatech.edu/integrity/policies/honor_code.php

As noted above, you may discuss homework assignments with one another, but be sure that the work you hand in is your own. The project assignment should be your own work. The examination will be closed book. Calculators will be allowed, but probably useless.

6. Fall 2005 Assignments

You should do at least the exercises below from Wheeden and Zygmund. The class homework (see below) is largely a selection from Wheeden and Zygmund, including some of the problems below.

* Chapter 2: #1, 2, 3, 4, 5, 6, 7, 8, 10, 11, 13, 14, 15, 16
* Chapter 3: #2, 4, 5, 7, 8, 9, 10, 11, 12, 13, 14, 17, 18, 20, 23
* Chapter 4: #1, 2, 4, 5, 6, 7, 8, 9, 10, 11, 15, 16, 17
* Chapter 5: #1, 2, 3, 4, 5, 8, 9, 10, 11, 13, 15, 20, 21
* Chapter 6: #1, 2, 3, 4, 6, 11
* Chapter 7: #5, 6, 7, 11, 12, 14, 15, 16
* Chapter 8: #1, 3, 5, 9-13, 16-18
* Chapter 10: #1-3, 5-11, 13-14, 17-18, 22-25, 27

Suleyman Ulusoy has posted some general Real Analysis Practice Problems (with solutions) at his web site http://www.math.gatech.edu/~ulusoy/
The graded assignments are given below. Their due dates will be announced in class as we approach them.

7. Notes for Fall 2005

Professor Lubinsky is preparing notes for his class this term. These are similar to the notes Prof. Heil and I prepared for the course last term. You can print off either set of these notes, as a supplement to the textbook, from Prof. Lubinsky’s Math 6327 web page or from my Summer 6327 page.

The graded homework assignments:

Format and conditions: Work the following problems and hand in your solutions. You may work together with other people in the class, but you must each write up your solutions independently. A subset of these will be selected for grading. Write LEGIBLY on the FRONT side of the page only, and STAPLE your pages together. You must also identify on your paper any people that you collaborated with, and any references you used other than our textbook.

NOTE: Your grade on each homework set is based on my ability to understand and evaluate what you have written. Therefore it is ESSENTIAL that you COMMUNICATE CLEARLY in your writing. ALL problems require either a proof or an explanation of what you have done, using complete, correct English sentences (mathematical symbols are simply abbreviations for words or phrases and may be used as parts of sentences). I will read EXACTLY what you write and will take what you write literally. I will not fill in missing steps or guess at what you “really mean.” Any symbols that you introduce that are not standard must be explained. YOUR EXPLANATIONS NEED NOT BE LENGTHY TO BE CLEAR, but you must carefully and logically demonstrate the validity of your solution to each problem.

MATH 6327 HOMEWORK #1
1. Do problem #4 of Chapter 2.
2. Do problem #9 of Chapter 3.
3. Do problem #11 of Chapter 3.
4. Let $E_1$ be a measurable subset of $\mathbb{R}^m$ and let $E_2$ be a measurable subset of $\mathbb{R}^n$. Prove that $E_1 \times E_2 = \{(x, y) : x \in E_1, y \in E_2\}$ is a measurable subset of $\mathbb{R}^{m+n}$. (compare Chapter 3 #11). Hint: First do the following special cases: a. both $E_1$ and $E_2$ are open, b. both $E_1$ and $E_2$ are G-delta sets, c. either $E_1$ or $E_2$ has measure zero.

MATH 6327 HOMEWORK #2
1. Do problem #23 of Chapter 3.
2. Do problem #2 of Chapter 4.
3. Do problem #11 of Chapter 4.
4. Do problem #15 of Chapter 4.

MATH 6327 HOMEWORK #3
1. Do problem #2 of Chapter 5.
2. Do problem #9 of Chapter 5.
3. Do problem #2 of Chapter 6.
MATH 6327 HOMEWORK #4
1. Do problem #7 of Chapter 7.
2. Do problem #12 of Chapter 7.
3. Do problem #11 of Chapter 8.
4. Do problem #17 of Chapter 8.