Math 5200-Real Variables.
Spring 2010

Instructor: Hakima Bessaih, 210 Ross Hall, Ext. 6213

URL: http://www.uwyo.edu/bessaih/

Office Hours: TR 10:00-11:00am, W 2:00-3:00pm and by appointment.

Class time & room: MW 12:00-1:15pm in RH 247.

Text. Real Analysis, 3rd edition, by H. L. Royden.

Reference material.

- Real Analysis Modern Techniques and their Applications, by Gerald B. Folland.
- Measure theory, by Paul R. Halmos.
- Real variables, by Alberto Torchinsky.
- Introductory real analysis, by A. N. Kolmogorov and S.V. Fomin.

Prerequisites. Mathematics 4200 and 4205 or introduction to set theory and point set topology and exposure to the notions of sequences and series, continuity, differentiability, Riemann-Stieljes integral and sequences and series of functions.

Course Description. In this course we will develop the modern techniques of real analysis in $\mathbb{R}^n$ and consider some of its applications. We will define and study the measures of sets in $\mathbb{R}^n$. Measurability and integration of function will be studied with the emphasis on Lebesgue theory. Next, we will develop the differentiation theory of a measure with respect to another measure and apply it to the Lebesgue measure. Using the above integration and differentiation theory we will develop the elements of functional analysis.
and the basic theory of $L^p$ spaces and as time permits will provide with some applications in Probability theory.

Tentative list of topics.

<table>
<thead>
<tr>
<th>Topics</th>
<th>Sections</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preliminaries</td>
<td>2.5-2.7 (1 weeks)</td>
</tr>
<tr>
<td>Lebesgue Measure</td>
<td>3.1-3.6, 11.1-11.6 (4 weeks)</td>
</tr>
<tr>
<td>The Lebesgue Integral</td>
<td>4.1-4.5 (3 weeks)</td>
</tr>
<tr>
<td>Differentiation and Integration</td>
<td>5.1-5.5 (2 weeks)</td>
</tr>
<tr>
<td>The classical Banach Spaces</td>
<td>6.1-6.5 (2 weeks)</td>
</tr>
<tr>
<td>Some Applications</td>
<td>(2 weeks)</td>
</tr>
</tbody>
</table>

Grading Policy.

- **Final exam**: The final exam takes place **on 07-May-2010, 1:15-3:15pm RH 247**. Look up to the final examination schedule: http://uwadmnweb.uwyo.edu/registrar/Spring2010/Sp10final.pdf. The final exam counts for **25%** of the final grade.

- **Midterms**: There will be one midterm exam tentatively scheduled for **10-Mar-2010, 4:00-6:00pm RH 247**. The midterm counts for **25%** of the final grade.

- **Homework**: There will approximately 7 to 8 homework assignments to be downloaded from the course home page. Homework counts for **50%** of the final grade.

- **Attendance**: Every student is expected to attend the lectures.

- **Grading scheme for the final grades**: Grade A: 90-100, Grade B: 80-89, Grade C: 70-79, Grade D: 60-69, Grade F: <60

- **Disability statement**: If you have a physical, learning, or psychological disability and require accommodations, please let me know as soon as possible. You will need to register with, and provide documentation of your disability to, University Disability Support Services (UDSS) in SEO, room 330 Knight Hall, 766-6189, TTY: 766-3073.
• **Academic honesty:** UW Regulation 6-802. The University of Wyoming is built upon a strong foundation of integrity, respect and trust. All members of the university community have a responsibility to be honest and the right to expect honesty from others. Any form of academic dishonesty is unacceptable to our community and will not be tolerated. Teachers and students should report suspected violations of standards of academic honesty to the instructor, department head or dean. Other University regulations can be found at: http://uwadmnweb.uwyo.edu/legal/universityregulations.htm

• **Comments:** I encourage you to work in groups outside of the classroom, you can discuss the text and the lectures. However, the homework assignments are supposed to be an individual task.

The information in this syllabus is subject to change. If there are changes, they will be announced repeatedly in class.