Math 522 - Analysis II
Fall 2013

Classes: MWF 11:00 a.m., van Vleck B115.

Instructor: Andreas Seeger

Text: *Principles of mathematical analysis*, by Walter Rudin.

Another book that I like: A Companion to Analysis: A Second First and First Second Course in Analysis, by T. W. Körner, published by the American Mathematical Society. It is on reserve in the Math library.

Some notes will be provided on the class website.

How to reach me:
Phone: 262-2932 or 277-9664.
E-mail: mylastname(at)math(dot)wisc(dot)edu

Office hours: To be announced. One of them will be scheduled on Tuesdays 3:00-3:50 p.m.

Exams: I am planning to give two midterm exams, most likely in class, and the format and dates will be announced later. The final exam is scheduled December 20, 12:25-2:25 p.m.

Grading: The final grade will be determined according to your performance in the midterm exams (each appr. 20%), homework (appr. 30%) and the final exam (appr. 30%). I reserve the right to deviate from this scheme.

Homework assignments: Homework will be assigned weekly, in class or by email, and will also be posted on the website. Every assignment needs to be written neatly and handed in on time (in class on the due date). Use of a version of TEXis encouraged but not necessary. Assignments will be graded (in part); late homework cannot be accepted.

All papers that you hand in are supposed to represent your individual contributions. You need to hand in your individual write-up of the solutions. *Any help that you get from other sources (for example other students, other textbooks, or a website) needs to be explicitly acknowledged.*

Exercises: In order to really learn this material one needs to do many problems, *more than may be required on the homework.* This applies in particular if you are planning to enter a Ph.D. program in mathematics.

You will notice that many of the assigned exercises in the book are quite hard. In class I may often recommend additional problems which are relevant to the covered material, both from the textbook and additional ones. A collection of analysis problems is posted at http://www.math.wisc.edu/∼seeger/522/a.pdf

Turn the page for a list of topics.

Topics

1. More on convergence. Review on series and uniform convergence. Series in normed spaces and completeness. Summation by parts. Multiplication of series. Infinite products.

Approximations of the identity. Approximation by polynomials, the Stone-Weierstrass theorem.

2. Special functions.

Exponential functions, and more on power series. Algebraic completeness of the complex field. Fourier series. Stirling's formula and the Γ-function.

3. The contraction principle.

With applications, in particular existence and uniqueness theorems for differential equations.

4. Differential calculus in normed spaces. Including the implicit function theorem and applications.

5. Compactness in metric spaces, with applications.

Characterizations of compactness in metric spaces, the Arzela-Ascoli theorem (with a concrete application such as the Peano's existence theorem for differential equations, if time permits).

6. Other optional topics.

Such as:

Rectifiability of curves.

The construction of real numbers.

Baire category with some applications.