

Course Title: Functions of a Real Variable

Course #: MATH 70200

Time and Location: Tue & Fri 2:00PM - 3:30PM

Instructor Name: Prof. Louis-Pierre Arguin

Contact Information: Cell: 646.312.4124

Pre-Requisites: The prequel MATH 70100 or similar course.

Office Hours: After class on Tuesday or by appointment

Description:

The course is the second installment of the year-long course in Real Analysis. We will cover the following subjects: measure theory and the Lebesgue integral, product measures and Fubini's theorem, the convergence theorems, differentiation and the Radon-Nikodym theorem,  $L_p$ -spaces, Hilbert and Banach spaces, Fourier series, elements of functional analysis. Most subjects required for the qualifying exams will be covered. Connections with probability theory, complex analysis and functional analysis will be highlighted.

Evaluation:

There will be around 5 problem sets during the semester. One of them will count as a take-home midterm. There will be a final exam in class. The final grade will be as follows

- Assignments 40%
- Take-home midterm 30 %
- Final exam 30%

Key to success:

Real analysis is a beautiful and deep subject. I hope that I will convince you of this during the semester! However, it demands hard and regular work to be rewarding. Mathematics is not a spectator sport! You will need to attempt all exercises given in class, relate them to the course notes, and discuss with your colleagues. Then, and only then, will it pay off. Have a great semester !

References:

- [1] E. M. Stein and R. Shakarchi, Real analysis, ser. Princeton Lectures in Analysis, III. Princeton University Press, Princeton, NJ, 2005, measure theory, integration, and Hilbert spaces.
- [2] W. Rudin, Real and complex analysis, 3rd ed. McGraw-Hill Book Co., New York, 1987.
- [3] G. B. Folland, Real analysis, 2nd ed., ser. Pure and Applied Mathematics (New York). John Wiley & Sons, Inc., New York, 1999, modern techniques and their applications, A Wiley-Interscience Publication.
- [4] M. Reed and B. Simon, Methods of modern mathematical physics. I, 2nd ed. Academic Press, Inc. Harcourt Brace Jovanovich, Publishers, New York, 1980, functional analysis