all, 1997 Basic Real Analysis MATH-603-01 Professor Alex Himonas

eal Analysis has its roots in the work of Archimedes and other ancient Greek athematicians who developed techniques for finding areas and volumes. In the eventeenth Century these techniques were further developed by Newton and eibniz into the theory of Calculus. In the Eighteenth and Nineteenth enturies,
ae power of calculus was applied to the study of many problems of both ractical and theoretical interest. For example, Fourier (1768-1830) used alculus (Fourier series) to solve the heat equation. However, most of the oncepts underlying Fourier analyses were understood in the Twentieth Century tarting with the development of a new integral by Lebesque (1900-1950).

ONTENT: The Lebesque measure and integral, together with the various notions o onvergence of a sequence of functions, will form the central theme of the firs emester. In addition, we shall discuss the relation between integration and fferentiation. We will start with a review of the notions of the limit, ontinuity, compactness, and the Riemann integral in the n-dimensional Euclidia pace. And, we will end with abstract measures and integrals being a traightforward generalization of the Lebesque measure and integral.

e will begin the second semester with an introduction to Banach and Hilbert paces, and will continue with LP spaces and Radon measures. The last part o ae semester will cover:

An introduction to Fourier Analysis;

Sobolev spaces and applications to partial differential equations;

An introduction to probability and the Brownian motion;

Contraction mapping theorem with applications to mathematical economics a ae proof of existence and uniqueness of solutions for a differential equation

Spectral theory for compact self-adjoint operators on a Hilbert space.

ae objective in this course is to present the essentials of modern analysis ogether with some of its applications in the study of both practical and eoretical problems. Analysis is a live subject, and we shall try to present
such.

EXTBOOKS:

Folland, G. B. , Real Analysis, Modern Techniques and Application, Wille SBN 0-471-80958-6.

Sheeden, R. L. and A. Zygmund, Measure and Integral, An Introduction to eal Analysis, Marcel Dekker, ISBN 0-8247-6499-4.