

**MATHEMATICS 4001**  
**FUNCTIONAL ANALYSIS**

Originally, in the early 20th Century, functional analysis meant simply the analysis of functionals. The discipline was placed on a rigorous foundation by Stefan Banach in the 1930s. The central idea is that of a normed linear space. Because many sets of mathematical objects have this basic structure, functional analysis attempts to unify these “spaces” and lift the analysis to higher levels where deeper properties may be observed. New insights are then obtained by reverting to the original objects.

**Text.** A typical book for this course is *Measure Theory and Integration* by G. de Barra (Ellis Horwood Publishing). (Course content is approximately chapters 1-5.)

**Marks.** 20% for weekly assignments, 30% for midterm test and 50% for the final examination.

**Calenda Description. 4001 Functional Analysis** includes metric and normed spaces, completeness, examples of Banach spaces and complete metric spaces, bounded linear operators and their spectra, bounded linear functionals and conjugate spaces, the fundamental theorems for Banach spaces including the Hahn-Banach Theorem, topology including weak and weak\* topologies, introduction to Hilbert spaces  
Prerequisite: Mathematics 3001

*Note: Credit cannot be received for both of Mathematics 4001 and the former Pure Mathematics 4302.*

**Offered:** Winter