(—; 3-0-0) **Functional Analysis** MATH-429*

Functional analysis deals with infinite dimensional vector spaces and linear mappings (operators) between them. In contrast to the finite dimensional case, questions about continuity and completeness of the spaces become crucial in the infinite-dimensional setting, and thus functional analysis has to combine algebraic, topological, and analytic arguments.

Historically, infinite dimensional vector spaces arose quite canonically as spaces of functions in the context of differential and integral equations. The abstract concepts and results developed in the course of these investigations are now at the basis of modern analysis.

The course will cover the basic aspects of Hilbert spaces, Banach spaces, bounded linear functionals and operators, Hahn-Banach theorem, principle of uniform boundedness. A main focus will be on spectral theory of operators (i.e., the generalization of questions about eigenvalues of matrices to infinite dimensions). In the course we will mainly restrict to the spectral theory of compact operators, but in the presentations we might also address the more general case of bounded operators (and thus talk about commutative Banach and C^*-algebras).

Textbook: *A Course in Functional Analysis*
by Conway (Springer-Verlag)

Prerequisite: MATH-328* *or* permission of the instructor.

Instructor: R. Speicher

Evaluation: Five assignments to be handed in and an in-class presentation.