

## Math 546: Hilbert Spaces Fall 2018

MWF 10:00-10:50 am, 447 Altgeld Hall  
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Office: 371 Altgeld Hall  
Office hours: Mo 4-5 pm, Wed 1-2 pm

This course will provide an introduction to the spectral theory of linear operators on Hilbert spaces. The main topics will include:

- Geometrical properties of Hilbert spaces.
- Basic theory of Banach algebras and  $C^*$ -algebras.
- Integration of vector-valued functions and holomorphic functional calculus.
- Spectral decomposition of bounded normal operators.
- Functional calculus with Borel functions.
- Unbounded operators on Hilbert spaces.
- Semigroups of operators.
- Compact operators. Schatten-von Neumann classes. Fredholm operators and index theory.
- Completely positive maps and dilation theory.
- Basics of von Neumann algebras.

**Prerequisites:** Successful completion of Math 541, or good acquaintance with Chapter 5 (Elements of Functional Analysis) and with Chapter 7 (Radon Measures) in Folland's book on Real Analysis.

**Textbook:** The textbook "A Course in Operator Theory" by John B. Conway (Graduate Studies in Mathematics, Vol. 21, American Mathematical Society, 2000) is recommended and will be used as main reference. The book "A Course in Functional Analysis" (Springer, 1990), by the same author, provides good resources for some parts of the course.

**Grading:** The final grade will be based on homework assignments and class participation.