Math 541: Functional Analysis
Spring 2022
Lectures: 11-11:50 am, 145 Altgeld Hall
Instructor: Florin P. Boca (fboca@illinois.edu)
Office Hours: TBA

This course provides an introduction to Functional Analysis. The main topics include:

- Review of abstract measure theory, Riesz representation theorem, Lebesgue-Radon-Nykodim theorem.
- Basic topics on Banach spaces, linear and bounded maps on Banach spaces, open mapping theorem, closed graph theorem.
- Locally convex spaces.
- Hahn-Banach theorem, Banach-Alaoglu theorem, extreme points, Krein-Milman theorem. Applications.
- Compact operators, spectrum and the spectral theorem for compact operators on Hilbert spaces.
- Weak operator topologies.
- Representations of compact groups and the Peter-Weyl theorems.
- The Fourier transform on $\mathbb{R}^k$.
- Tempered distributions.
- Sobolev spaces.

Prerequisite: Math 540.

Textbook: There is no required textbook. The instructor will use his own notes.
Recommended textbooks:

- J. B. Conway, A Course in Abstract Analysis.
- J. B. Conway, A Course in Functional Analysis.
- W. Rudin, Functional Analysis.
- G. B. Folland, Real Analysis. Modern Techniques and their Applications.
- Y. Benyamini and J. Lindenstrauss, Geometric Nonlinear Functional Analysis.

Grading: The final grade will be based on six homework assignments (90%) and class participation (10%).