6150 FUNCTIONAL ANALYSIS FALL 2020
TR 2-3:20 PM GAB 461

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This course is an introduction to Functional Analysis and common functional analytic techniques. Some of the basic principles of functional analysis (Hahn-Banach, Open mappings, etc.) are covered in Real Analysis series, we will recall and built on those. And then we will cover the basics of

(1) Weak and weak* topologies, and duality
(2) Bases and basic sequences
(3) Structure of the classical Banach spaces $C(K)$, L_p, c_0, ℓ_p ($1 \leq p \leq \infty$).
(4) The algebra of bounded linear operators

No textbook is required. However, we will follow these notes (click here to download a copy) somewhat closely.

Grading will be based on attendance and a class presentation. Each participant selects a project and writes a short but concise exposition (less than 5 pages or so) and present in class. In most cases, a project consists of presenting a single theorem, or explaining a widely used notion. I will meet with you in the second week to select a project that is likely be helpful to your own thesis research. I will provide references and clear instructions on what to include in the project. Some sample project topics are

- Ramsey theorem and applications
- Ordinal indices and Bourgain's index theory
- Finite dimensional normed spaces and Auerbach theorem
- Cantor-Bendixson index and classification of $C(K)$ spaces for K countable compact
- The standard Borel space of all separable Banach spaces
- Pelczynski's universal space
- Conditional expectation and the unconditionality of Haar basis
- Compact operators
- Spectral theorem
- Invariant subspaces
- Fixed point theorems
- Tsirelson space
- James space

You are welcome to suggest your own.

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