

**MATHEMATICS 511**  
**Operator Theory and Applications**

**PREREQUISITES:**

- A course in measure theory at the level of UBC's Math 420/Math 507.
- It would be desirable to have also taken a course on Hilbert and/or Banach spaces like UBC's Math 421/Math 510, but this is not essential. I will adjust the level of the course according to what proportion of the class have taken such a course.

**INSTRUCTOR:**

- Joel Feldman
- Math building room 221
- 604-822-5660
- [feldman@math.ubc.ca](mailto:feldman@math.ubc.ca)
- <http://www.math.ubc.ca/~feldman/>
- office hours: Mon 2:30–3:30, Tue 10:30–11:30, Thr 10:00–11:00
- Location of lectures: MATX 1102
- Time of lectures: Tue, Thr 14:00–15:20

**TEXT:** Michael Reed and Barry Simon, **Functional Analysis** (Methods of modern mathematical physics, volume 1, Academic Press, 1980). This is an excellent book, but it is also unconscionably expensive. So I have not made it a required textbook.

I will post all handouts, problem sets, etc. on the web at  
<http://www.math.ubc.ca/~feldman/m511/>

**TOPICS:**

1. Review of Hilbert and Banach Spaces:
  - Definitions, examples, elementary geometry
  - Operators - linear, bounded, compact, hermitian, self-adjoint, unitary
2. The Spectral Theorems:
  - I will state several versions of the spectral theorem. The extent to which this is treated as a review, and in particular how many proofs I give, will depend on what proportion of the class has already seen rigorous proofs of one or more variants of the spectral theorem.
3. Unbounded Operators:
  - Examples
  - Closed and closeable unbounded operators
  - Adjoints, symmetric operators, self-adjoint operators, self-adjoint extensions
  - Spectral theory for unbounded operators
  - Bloch theory and the spectrum of periodic Schrödinger operators

**GRADING:**

- The grade will be based on regular problem sets.

**POLICIES:**

- Working together on homework is encouraged, but you should write your solutions on your own.
- Missing a homework normally results in a mark of 0. Exceptions may be granted in two cases: prior consent of the instructor or a medical emergency.