# Math 511
## Operator theory and applications

**Instructor Information**

Instructor: <u>Richard Froese</u>
Email: <u>rfroese-at-math-dot-ubc-dot-ca</u>
Office: Math Annex 1106
Hours: By appointment
Phone: 604-822-3042

**Course Information**

Section 101
Tuesday and Thursday 14:00-15:20
MATH 202

This page
http://www.math.ubc.ca/~rfroese/math511
will be updated throughout the term.

**Problem sets**

I will post problem sets here periodically throughout the term. Your grade in the course will be based on these.

**Prerequisites**

- A course in measure theory at the level of UBC's Math 420/507, and the basics of Hilbert and Banach spaces (which we will review).

**(Optional) Text**

- Reed and Simon, *Methods of Modern Mathematical Physics, Vol I*: This is an excellent book, but very expensive, so it is not required.

**Topics**

**1. Review of Hilbert spaces and Banach spaces**

- Definitions, examples, strong and weak convergence.

## 2. Bounded operators on Hilbert space

- Topologies, adjoints, self-adjoint operators, resolvents and spectrum, spectral radius, unitary operators, (partial) isometries, positive operators, polar decomposition, spectral theorem for bounded self-adjoint operators.

## 3: Unbounded operators

- Closed operators, extensions, adjoints, resolvents and spectrum, symmetric and self adjoint operators, spectral theorem, unitary groups and Stone's theorm, quadratic forms

## 4: Compact operators

- Definitions, analytic Fredholm theorem, trace ideals, trace, determinant and Lidski's theorem, g(p)f(x)