Introduction to topics in functional analysis that are used in the analysis of ordinary and partial
differential equations. Metric and normed linear spaces, Banach spaces and the contraction map-
ing theorem, Hilbert spaces and spectral theory of compact operators, distributions and Fourier
transforms, Sobolev spaces and applications to elliptic PDEs.

**Prerequisites:** undergraduate analysis, linear algebra and complex variables. Some exposure to
partial differential equations is desirable but not essential.

**Instructor:**
John C. Schotland
4846 East Hall
schotland@umich.edu

**Office hours:** by appointment

**Textbook:** Applied Analysis by Hunter and Nachtergaele

**Suggested Reading:**
1. Functional Analysis by Reed and Simon
2. Functional Analysis by Lax
3. Mathematics for Physics by Stone and Goldbart

**Course Outline**
Week 1 – Overview
Week 2 – Metric and normed linear spaces
Week 3,4 – Banach spaces
Weeks 5,6 – Hilbert spaces
Weeks 7,8 – Spectral theory
Weeks 9,10 – Distributions and Fourier transforms
Week 11,12 – Sobolev spaces
Week 13 – Elliptic boundary value problems

**Homework:**
Problem sets will be assigned roughly every two weeks. You are permitted to work together on the
problems. However, you must write up your solutions independently.

**Exams:** There will be a take-home final exam.

**Final Grade:**
Will be determined from the average score on the problem sets.