

## Mat 578 — Functional Analysis I — Fall 2024

<b>Line No.</b>	60828
<b>Time</b>	TuTh 10:30-11:45 AM
<b>Room</b>	WXLR 546
<b>Instructor</b>	Jack Spielberg
<b>Office</b>	WXLR 747
<b>Office Hours</b>	TBA, and by appointment.
<b>e-mail</b>	jack.spielberg@asu.edu
<b>Text</b>	Folland, <i>Real Analysis, 2nd edition</i> , Wiley 1999

### Course Description

This is the first half of a year-long sequence in functional analysis. Functional analysis is the study of infinite dimensional vector spaces. Unlike finite dimensional linear algebra, in infinite dimensions questions of continuity are crucial. Thus a vector space must be given a topology, and there are various choices that are important. Therefore the course will include a review of portions of general topology. We will cover those portions of functional analysis involving topological vector spaces, including Banach spaces, Hilbert space, and general locally convex spaces. Major results to be covered will include the open mapping theorem, closed graph theorem, uniform boundedness principle, Hahn-Banach theorem, Alaoglu theorem, and the Krein-Milman theorem. In the spring semester the continuation will be a course on operator theory and spectral theory.

For a large part of the course we will follow the text of Folland (portions of chapters 4 - 8). Notes will be provided on topological vector spaces to supplement the material in chapter 5, and on other topics as needed.

**Prerequisites:** This course is open for undergraduate enrollment (as well as graduate, of course). Normally, the prerequisite would be MAT 571, or MAT 472-473, or a previous course on metric spaces and some knowledge of measure theory (and instructor approval). Much, but not all, of the course will be intelligible without background in abstract measure theory. For someone willing to do some background reading on measure theory, the minimal prerequisite would be a course on metric space topology (such as MAT 472), and instructor approval.

Questions about the course are welcome, and should be addressed to the instructor by email. In particular, if you are interested in the course but are not sure whether you are ready for it, you are encouraged to contact the instructor.