Syllabus for Math 502, Functional Analysis, Fall 2013

There are two texts for this course, *Analysis* by Lieb and Loss, which is denoted below by L^2, and *Real analysis* by Folland, which is denoted below by F. There will occasionally be notes posted in class on topics that are not covered in either text, at least not in a convenient form. (Though Folland has has a whole Chapter on topology, the parts of we need to get going on functional analysis are scattered throughout it.)

WEEK 1: Jan 23 : Introduction to the course.
Reading: Topology notes posted online.

WEEK 2: Jan 28, 30: Topology Continued
Reading: Topology notes posted online. Also, as a supplement, Sections 4.1-4.4 and 4.6-4.7 in F.

WEEK 3: Feb. 4, 6: L^p spaces, introduction.
Reading: 2.2-2.4, and 2.7 in L^2, 6.1 and 6.2 in F.

WEEK 4: Feb 11, 13: Duality, weak topology.
Reading: 2.5, 2.6 and 2.9-2.11 in L^2 and 6.4 in F.

WEEK 5: Feb 18, 20: Bounded operators on L^p, interpolation.
Reading: 6.3 in Folland.

WEEK 6: Feb 25, 27: Baire Category and Uniform boundedness in L^p, Banach-Alaoglu for L^p,
Reading: 2.12 -2.20 in L^2, 5.3 in F.

WEEK 7: Mar 4, 6: Hilbert Space
Reading: 5.5 in F, 2.21 in L^2.

WEEK 8: Mar 11,13: Banach spaces and Topological Vector Spaces in general. Hahn-Banach Theorems. Strong compactness in L^p.
Reading: Chapter 5 in F.

• **First Midterm Exam** Wed Mar 13. This will be based on the material from weeks 1 through 6.

WEEK 9: Mar 25, 27: Radon measures, Riesz-Markov Theorem
Reading: 4.5 (on locally compact Hausdorff spaces) and 7.1-7.3 in F, 6.22 in L^2.

WEEK 10: Apr. 1, 3: Radon measures continued. .
Reading: 7.4 in F, and class notes, to be posted, and 3.1-3.4 in F.

WEEK 11: Nov. 8, 10: Signed measures differentiation theorems
Reading: 3.1-3.3 in F.

WEEK 12: Apr. 15, 17: Fourier analysis
Reading: 3.4-3.6 in F, 5.1-5.4 in L^2.

WEEK 13: Apr 22-24: Fourier analysis continued.
Reading: 8.1-8.5 in F, 5.5-5.10 in L^2.

WEEK 14: Apr 29, May 1: Applications an review.
Reading: Class notes.

WEEK 15: May 6 : Applications and review

FINAL EXAM: