

**UNIVERSITY OF PUERTO RICO
RIO PIEDRAS CAMPUS
DEPARTMENT OF MATHEMATICS**

**FUNCTIONAL ANALYSIS I
PH.D. QUALIFYING EXAM
SYLLABUS**

The Ph.D. qualifying exam is based on the one semester graduate course Functional Analysis I, which includes the following topics:

1. Normed spaces, Banach spaces, dual spaces.
2. Baire category theorem, uniform boundedness principle, open mapping theorem, closed graph theorem, Hahn-Banach theorem, separation of convex sets.
3. Hilbert spaces. Bounded operators.
4. Compact operators.
5. Spectral theory of self-adjoint operators.

Exam format:

There will be five problems in the exam. Each problem is worth 25 points. Only the best four solution of each student will be counted. The passing score is 60 points or more.

References:

1. W. Rudin, *Functional Analysis*, 2nd edition, McGraw-Hill, 1991.
2. P.D. Lax, *Functional Analysis*, Wiley-Interscience, 2002.
3. M. Reed and B. Simon, *Method of Modern Mathematical Physics, Vol. I: Functional Analysis*, Academic Press, 1980.