

# PMATH 753, FALL 2012: SYLLABUS

Instructor: Nico Spronk

This is an approximate outline of topics we will cover.

- Normed/Banach spaces: topological spaces,  $\mathcal{C}_b(X)$ ; Hölder's & Minkowski's inequalities,  $\ell_p$  spaces; spaces of linear functionals/operators.
- Dual spaces: Hahn-Banach theorem, separation by hyperplanes.
- Consequences of Baire category theorem: Banach-Steinhaus theorem, open mapping theorem, closed graph theorem; applications: complemented subspaces.
- Weak topologies, product topologies: compactness, Tychonov's theorem, Banach-Alaoglu theorem, metrisation; second dual spaces: Goldstine's theorem, reflexivity; Krein-Milman theorem.
- Euclidean/Hilbert spaces: Cauchy-Schwarz inequality, Orthogonal decomposition, Riesz representation theorem, orthonormal systems and orthonormal bases.
- Linear operators on Banach spaces: adjoint operators, Gelfand spectrum.
- Compact operators: spectral theorem.

**Use of text:** We will aim to cover, in whole or in part, Chapters 1-5, 8-14 in the text *Linear Analysis*. I will supplement some of the topological material which is required.