Math 604, Real Analysis, Spring, 2004

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Text book: *Real Analysis* by Folland.

Real analysis is the foundation on which many theory are built. Math 604 is a continuation of Math 603. In Math 604, the following materials will be covered.

1. Banach spaces. Dual-spaces and their conjugates, the Riesz-Fisher Theorem, the Riesz Representation Theorem for bounded linear functionals on $C(X)$, the Riesz Representation Theorem for $C(X)$, the Hahn-Banach Theorem, the Closed Graph and Open Mapping Theorems, the Principle of Uniform Boundedness, Alaoglu's Theorem, Hilbert spaces, orthogonal systems, Fourier series, Bessel's inequality, Parseval's formula, convolutions, Fourier transform, distributions.

2. Sobolev spaces. Marcinkiewicz interpolation theorem, Calderon-Zygmund decomposition lemma, singular integrals and L^p estimates for Newtonian potential.

3. Families of functions. Equicontinuous families and the Arzela-Ascoli Theorem, the Stone-Weierstrass Theorem.

Exams: There will be a mid-term exam and a final exam. Both are take-home exams.

Grade: The course grade is based on weekly homework and exams.