Real Analysis (Ph.D.)

Preparatory Courses: Math 5143, 5153

1. Algebras and sigma-algebras of sets, outer measures and the Caratheodory construction of measures, especially for Lebesgue-Stieltjes measures, Borel sets, Borel measures, regularity properties of measures, measurable functions.

2. Construction of the integral with respect to a measure, convergence theorems: Lebesgue dominated convergence theorem, Fatou's Lemma, and monotone convergence theorem, Egorov's Theorem, Lusin's Theorem, product measures and Fubini's Theorem.


5. Introductory functional analysis: Baire Category, Hahn-Banach theorem, uniform boundedness principle (Banach-Steinhaus), open mapping theorem, closed graph theorem, weak topologies, $L^p$ spaces, completeness of the $L^1$ spaces, Minkowski and Holder inequalities, elementary Hilbert space theory, Fourier series in $L^2$, Riesz Representation theorems in $L^p$ and $C(X)$.

REFERENCES: Folland, Real Analysis; Royden, Real Analysis; Rudin, Real and Complex Analysis; Hewitt and Stromberg, Real and Abstract Analysis.