Statistics and Probability Preliminary Exam Syllabus

Department of Mathematical Sciences
University of Cincinnati

Statistics Theory

Exponential Families; Sufficient Statistics, Convex Loss Functions. UMVU Estimators;
The Information Inequality; The Multiparameter Case and Other Extensions;
Bayesian inference; Asymptotic Efficiency; Efficient Likelihood Estimation; the
Neyman-Pearson fundamental lemma; Distributions with monotone likelihood ratio; A
generalization of the fundamental lemma; Two-sided hypotheses; Least favorable
distributions; Unbiasedness for hypothesis testing with one parameter exponential
families; Similarity and completeness; UMP unbiased tests for multiparameter
exponential families.

This material is covered in STAT7021 Statistics Theory

Suggested Texts: *Statistical Inference*, 2nd Edition, Casella-Berger,
Theory of Point Estimation, Lehmann-Casella
Testing Statistical Hypotheses, Lehaman

Probability Theory

Probability measures. Existence and extensions. The Borel-Cantelli Lemmas. Zero-one
law. Simple random variables. Convergence of random variables in probability and
almost sure. Measures in Euclidian spaces. Measurable functions and mappings.
Distribution functions. The integral. Integral with respect to Lebesgue measure. Product
measure and Fubini's theorem. Distributions. Expected values. Inequalities and limit
theorems for sums of independent random variables. Weak convergence. Characteristic
functions. The central limit theorem.

This material is covered in STAT7032 Probability

Suggested Texts: *Probability and Measure,* P. Billingsley, 3rd ed. (1995) or anniversary
edition (2012).