

## Statistical Estimation

**Department:** MATH

**Course Number:** 6262

**Hours - Lecture:** 3

**Hours - Lab:** 0

**Hours - Recitation:** 0

**Hours - Total Credit:** 3

**Typical Scheduling:** Every spring semester

**Description:**

Basic theories of statistical estimation, including optimal estimation in finite samples and asymptotically optimal estimation. A careful mathematical treatment of the primary techniques of estimation utilized by statisticians.

**Prerequisites:**

[Math 4261](#), [Math 4262](#) or equivalent and [Math 6241](#)

**Course Text:**

At the level of Lehmann, *Theory of Point Estimation*

**Topic Outline:**

Statistical decision theory: geometry of decision problems, the fundamental theorem of game theory and its use in statistical decision theory, specialized techniques for finding minimax and Bayes estimators in standard problems of estimation

The Bayesian viewpoint: solving the no-data problem and using it in univariate and multivariate settings, detailed analysis for conjugate priors

Optimality under restrictions:

Minimum variance unbiased estimation: the Rao-Blackwell and Lehmann-Scheffe theorems

Equivariant estimation: invariance of statistical problems under groups and some applications in estimation

Asymptotic theory of estimation:

General notions of asymptotic optimality: Hodges counterexample

Le-Cam's theorem on asymptotic optimality

Asymptotic optimality of maximum likelihood estimators, special cases including logistic regression

Robust estimators (M, L, and R) and their asymptotic relative efficiencies

Asymptotic optimality of Bayes estimators including higher order analysis characterizing asymptotic posterior distributions