

STATISTICS 421 "MATHEMATICAL STATISTICS"

Calendar Description: H(3-0)

Multivariate Normal distribution. Limit distributions. Sufficient statistics. Completeness of families of distributions. Exponential families. Likelihood ratio tests. Chi-square tests. Analysis of variance. Sequential tests. Introduction to nonparametric methods. Bayesian theory, the general linear model.

Prerequisite: Mathematics 323 and 353.

Suggested Texts:

1. Hogg & Craig, Introduction to mathematical statistics
2. Casella & Berger, Statistical Inference

Syllabus

<u>Topics</u>	<u>Number of Hours</u>
Review – Handouts with examples, review problems on: common univariate distributions; use of cdf, mgf, pdf; variable transformations (Jacobians, graphical domain transformation); distribution of order statistics.	2
Multivariate Normal Distribution definition, mgf, joint marginals, constant density contours; distributions of linear combinations of MVN random variables.	3
Limit Distributions concept of a degenerate distribution; convergence in distribution (use of the cdf, mgf); convergence in probability; proof of the CLT; use/proof of Slutsky's theorem.	5
Sufficiency and Completeness concept of a sufficient set of statistics, factorization theorem; Rao-Blackwell theorem; concept of a complete family of distributions; completeness and uniqueness (Lehmann-Scheffe theorem); minimal sufficient and ancillary statistics; completeness and independence (Basu's theorem); minimum variance unbiased estimation; Cramer-Rao inequality.	8
Exponential family of distributions	2
LR Tests review of likelihood ratio, Neyman-Pearson lemma; power of a test, uniformly most powerful test; noncentral t, chi-square, F distributions.	5
Normal Models Cochran's theorem on quadratic forms (no proof); chi-square tests; analysis of variance.	5
Additional Topics - Selections from the following topics should constitute about 6-8 hours. - sequential tests - general linear model - nonparametric tests (sign, Wilcoxon) - Bayesian theory	6
TOTAL	36
