UNIVERSITY OF CALGARY

FACULTY OF SCIENCE
Department of Mathematics and Statistics

Statistics 421 Mathematical Statistics

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.
Course Hours: H(3-0)
Prerequisite(s): Mathematics 323 and 353.

Suggested Texts:

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

Syllabus

Topics	**Number of Hours**
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 ancillery 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**

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2000:04:19 PFE
Calendar change H(3-1T) to H(3-0); Prerequisite change Fall 2009