UNIVERSITY OF CALGARY

FACULTY OF SCIENCE
Department of Mathematics and Statistics

MATHEMATICS 323
"INTRODUCTION TO MATHEMATICAL STATISTICS"

Calendar Description: H(3-1T)

Bivariate distributions. Sampling distributions. Chi-Squared, F, and t distributions. Estimation. Hypothesis testing (proportions, means, variance, chi-square). Method of moments. Maximum likelihood estimators. Neyman-Pearson lemma. Likelihood ratio tests. Elementary regression and correlation.

Prerequisite: Mathematics 321. **Corequisite:** Mathematics 353.

Suggested Text: This outline is indexed to "Mathematical Statistics with Applications", by D.D. Wackerly, W.M. Mendenhall, and R. L. Scheaffer, Sixth Edition. Duxbury Press, in order to provide an indication of the depth of coverage of the various topics.

Syllabus

Topics	**Number of Hours**
Chapter 5: Bivariate and Multivariate Probability Distributions, Marginal and Conditional Probability Distributions; Independent Random Variables; Covariance and other expectations. The Bivariate Normal Distribution.	**6**
Chapter 6 (6.1-6.7): Functions of Random Variables, including the method of transformation (Jacobian method) and the method of moment generating functions for more than one random variable. Order statistics and their applications.	**6**
Chapter 7 (7.2): Sampling distributions; the derivation of the chi-square, t, and F distributions; Revisit the central limit theorem and derive the distribution of the sample variance.	**3**
Chapter 8 (8.1-8.4): Estimation: unbiasedness, mean square error, evaluation of point estimators. Confidence interval estimation for the difference between two population parameters; confidence interval estimation for the population variance.	**4**
Chapter 9 (9.2, 9.3, 9.6, 9.7): Some properties of point estimators, including relative efficiency, consistency; some common method of obtaining point estimators, including the method of moments and maximum likelihood estimation.	**5**
Chapter 10: Developing formal hypothesis tests using discrete and continuous distribution theory, Type I and Type II errors, power of a test and the Neyman-Pearson Lemma, P-values, uniformly most powerful tests, likelihood ratio tests.	**6**
Chapter 11 (11.1-11.9): Simple Linear Regression Analysis: Least squares estimation, inference for estimated coefficients, prediction, model assessment, correlation and the coefficient of determination.	**6**
TOTAL	**36**

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