UNIVERSITY COLLEGE OF THE FRASER VALLEY

COURSE INFORMATION

DEPARTMENT: Mathematics **DATE:** June 1994

Mathematics 451	Parametric statistical inference	3
NAME & NUMBER OF COURSE	DESCRIPTIVE TITLE	UCFV CREDIT

CATALOGUE DESCRIPTION: A course on the ideas, nomenclature and techniques of the main schools of parametric statistical inference, namely, likelihood, Neyman-Pearson, Bayesian. The general similarities of the inferences made by each school will be emphasised, but inference situations which are controversial will also be discussed. This course is directed towards students specialising in either mathematics or statistics.

COURSE PREREQUISITES: Math 450

COURSE COREQUISITES: None

HOURS PER TERM FOR EACH STUDENT	Lecture	60 hrs	Student Directed Learning		hrs
	Laboratory	hrs			
	Seminar	hrs	Other - specify:		
	Field Experience	hrs			hrs
			TOTAL	60	HRS

UCFV CREDIT TRANSFER	UCFV CREDIT NON-TRANSFER	NON-CREDIT

TRANSFER STATUS (Equivalent, Unassigned, Other Details)

UBC credits

SFU credits

UVIC units

Other

Math Curriculum Committee	J.D. TUNSTALL Ph.D.
COURSE DESIGNER	DEAN OF ACADEMIC STUDIES

OUTLN93/10/DD

Math 451 - Parametric statistical inference
NAME & NUMBER OF COURSE

COURSES FOR WHICH THIS IS A PREREQUISITE:	**RELATED COURSES**
none	

TEXTBOOKS, REFERENCES, MATERIALS **(List reading resources elsewhere)**

TEXTS: **Probability and Statistical Inference, Volume 2: Statistical inference. Kalbfleisch, J.G. (Springer-Verlag, 1985)**

Introduction to the Theory of Statistics. Mood, Graybill & Boes. (McGraw-Hill).

Introduction to Probability and Statistics, from a Bayesian viewpoint. Part 2: Inference. D.V. Lindley (Cambridge University Press)

OBJECTIVES:

This course is designed to enable students to be familiar, in a straightforward manner, with the standard tools of parametric statistical inference, excluding linear model theory. These will include:

1. **The method of likelihood.**

2. **The frequency or Newman-Pearson approach. Where possible, the sampling distribution approach will be illustrated by simulation.**

3. **Bayesian inference.**

In addition, there will be discussion about special problems and techniques, such as: conditional and marginal likelihoods, conditional tests, exact tests, the problem of the relevant reference set.

In particular, the general similarities of the inferences made by each school of thought will be emphasised, but inference situations which are controversial will also be discussed.

STUDENT EVALUATION PROCEDURE:

Assignments	**10%**
Midterm exams	**30%**
Final exam	**60%**

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COURSE CONTENT

1. **Likelihood methods: likelihood, method of maximum likelihood, score and information functions, relative likelihood and contour maps, likelihood regions and intervals, continuous models, censoring, invariance, transformations, normal approximations, numerical methods.**

2. **Frequency or Neyman-Pearson methods: sampling distributions (use of computer where possible), expected (or Fisher) information, the likelihood ratio statistic, Pearson's chisquare approximation, confidence intervals, tests of significance, power, unbiasedness, uniformly most powerful tests. The sequential probability ratio test. Sample size estimation**

3. **Special cases: nuisance parameters, the problem of the number of parameters increasing with the sample size, conditional and marginal likelihoods, residual maximum likelihood estimation, sufficient and ancillary statistics, the exponential family, conditional tests, exact tests, the reference set. [Fiducial inference, if time allows.]**

4. **Bayesian inference: prior and posterior distributions, posterior intervals, Bayesian significance testing - the Bayes' factor, predictive distributions and intervals, setting the prior distribution - simple priors, invariance priors, conjugate priors, quantification of prior knowledge, priors for multi-parameter situations, exchangeability; the Gibb's sampler; empirical Bayes. Sequential experimentation. Sample size estimation with prior information and costs.**

5. **Discussion of competing inferences in common situations.**