UNIVERSITY COLLEGE OF THE FRASER VALLEY

COURSE INFORMATION

DEPARTMENT: Mathematics **DATE:** July 1994

Mathematics 450	Parametric statistical theory	3
NAME & NUMBER OF COURSE	DESCRIPTIVE TITLE	UCFV CREDIT

CATALOGUE DESCRIPTION: An introduction to the ideas, nomenclature and techniques of the main schools of parametric statistical inference, excluding linear model theory. This is a theoretical course directed towards students specialising in either mathematics or statistics.

COURSE PREREQUISITES: Math 211, 221, 270 and at least three upper level courses in math and/or statistics.

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

Math 450
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 inference 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%**

Math 450
NAME & NUMBER OF COURSE

COURSE CONTENT

1. **Brief review of probability, distributions and the statistical application of certain limit theorems: conditional probability, independence, Bayes' theorem; joint, marginal and conditional distributions; conditional expectation; bivariate and multivariate normal distribution; laws of large numbers, the central limit theorem.**

2. **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.**

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

4. **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.]**

5. **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.**

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