UNIVERSITY COLLEGE OF THE FRASER VALLEY

COURSE INFORMATION

DISCIPLINE/DEPARTMENT: Mathematics **IMPLEMENTATION DATE**: October 1993

Revised: December 1996

Math 280	Further Topics in Probability and Statistics	3
SUBJECT/NUMBER OF COURSE CREDITS	**DESCRIPTIVE TITLE**	**UCFV**

CALENDAR DESCRIPTION: Topics include conditional probability and expectation, Markov chains, Poisson processes, lifetime distributions and reliability, general inference techniques, fitting and testing simple probability models, application to production management and quality control, sequential analysis (as time permits).

RATIONALE:

COURSE PREREQUISITES: Math 270

COURSE COREQUISITES: None

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

MAXIMUM ENROLMENT: 35

Is transfer credit requested? **:** **Yes** **9** **No**

AUTHORIZATION SIGNATURES:

Course Designer(s): Math Department **Chairperson**: N/A

Curriculum Committee

Department Head: S. Milner **Dean**: W. Welsh

PAC: Approval in Principle _____ **PAC: Final Approval**: 1996

(Date) **(Date)**

OUTLN95/01/dd

Math 280
NAME & NUMBER OF COURSE

SYNONYMOUS COURSES:

(a) replaces _____
(course #)

(b) cannot take _____ for further credit
(course #)

SUPPLIES/MATERIALS:

TEXTBOOKS, REFERENCES, MATERIALS (List reading resources elsewhere)

J.G. Kalbfleisch, Introduction to Probability and Statistics. S[pringer-Verlag.
D.V. Lindley (1964), Introduction to Probability and Statistics: Part 1 Probability, Part 2 Inference. Cambridge University Press.
Leo Breiman (1969), Probability and Stochastic Processes, with a view towards applications. Houghton Mifflin Company.

OBJECTIVES:

1. Learn to develop simple mathematical/probabilistic models as a basis for a first look at a data situation.
2. Be conversant with various methods of measuring how well the data fits the supposed model.
3. Become acquainted with the viewpoints of the major schools of inference and the similarities and differences of the outcomes of these approaches.

METHODS:

STUDENT EVALUATION PROCEDURE:

Assignments and quizzes	20%
In-class tests	40%
Final exam	40%

Math 280
NAME & NUMBER OF COURSE

COURSE CONTENT

Review of probability rules, conditional probability and independence. Genetical applications - the Hardy-Weinberg law - inbreeding.

Review of discrete probability mass function, distribution function, expectations. If X $ 0, then E(X) = 3(1 - P_r). The Poisson process. Review of continuous random variables, probability density functions. The uniform distribution, application to equi-probable problems (e.g., Buffon).

The exponential waiting time, the gamma, the extreme value, the Weibull distributions. Reliability, in series and parallel.

The simple random walk in 1-dimension, extension to continuous time, the diffusion equation, the asymptotic normal distribution, diffusion with drift.

Review of probability distributions of several variables. The bivariate normal, correlation and covariance. The dispersion matrix, the Poisson process, the autocorrelation function, conditional and joint generating functions.

Simple Markov chains; states, transitions, barriers, recurrent and transient states, applications.

A first look at some competitive techfniques of inference: frequentist or Neyman-Pearson, Fisherian and likelihood, Bayesian; tests of hypotheses, P-values, Type I and II errors, Power, Bayesian Odds, the Bayes factor; confidence, fiducial, and posterior probability intervals. Sample size calculations under differing viewpoints.

Fitting data to models. Methods of measuring adequacy of fit: comparison of moments, e.g., the chi-square index of dispersion, Q-Q plots and correlation, replication, goodness-of-fit tests. Quality control: Shewhart charts, cu-sum charts and associated methods.

(As time permits) A first look at sequential testing, Wald's SPRT-test, closed sequential tests, the inconsistency of the SPRT under interval hypotheses, cornfield and Lachin's criticisms and suggested alternatives. Simulation.