UNIVERSITY COLLEGE of the FRASER VALLEY

COURSE IMPLEMENTATION DATE: July 1994
COURSE REVISED IMPLEMENTATION DATE: September 2006
COURSE TO BE REVIEWED: April 2009
(Four years after implementation date) (MONTH YEAR)

OFFICIAL COURSE OUTLINE INFORMATION

Students are advised to keep course outlines in personal files for future use.
Shaded headings are subject to change at the discretion of the department and the material will vary - see course syllabus available from instructor

FACULTY/DEPARTMENT: **Science, Health & Human Services / Mathematics & Statistics**

MATH 450		**3**
COURSE NAME/NUMBER	FORMER COURSE NUMBER	UCFV CREDITS

Statistical Distribution Theory
COURSE DESCRIPTIVE TITLE

CALENDAR DESCRIPTION:

This is a course in mathematical statistics. It is the continuation of Math 370 in the stream of theoretical statistics, which is designed for students specializing in either mathematics or statistics. Topics include distributions of functions of random variables; transformations of discrete and continuous random variables; beta, t, and F distributions; order statistics; multivariate normal distribution; convergence in distribution and probability; the Law of Large Numbers; the Central Limit Theorem; method of maximum likelihood; confidence intervals; and tests of statistical hypotheses.

PREREQUISITES: **MATH 370 or (MATH 211, 221, 270 and at least three upper level courses in math and/or statistics).**
Effective September 2006, the prerequisites will be: MATH 370.

COREQUISITES:

SYNONYMOUS COURSE(S)
(a) Replaces: _____ *(Course #)*
(b) Cannot take: _____ *(Course #)* for further credit.

SERVICE COURSE TO: _____ *(Department/Program)* _____ *(Department/Program)*

TOTAL HOURS PER TERM: **60**
STRUCTURE OF HOURS:

Lectures:	**60**	Hrs
Seminar:		Hrs
Laboratory:		Hrs
Field Experience:		Hrs
Student Directed Learning:		Hrs
Other (Specify):		Hrs

TRAINING DAY-BASED INSTRUCTION
LENGTH OF COURSE:
HOURS PER DAY:

MAXIMUM ENROLLMENT: **36**
EXPECTED FREQUENCY OF COURSE OFFERINGS: **every second year**

WILL TRANSFER CREDIT BE REQUESTED? (lower-level courses only)	☐ Yes	☒ No
WILL TRANSFER CREDIT BE REQUESTED? (upper-level requested by department)	☐ Yes	☒ No
TRANSFER CREDIT EXISTS IN BCCAT TRANSFER GUIDE:	☐ Yes	☐ No

AUTHORIZATION SIGNATURES:

Course Designer(s): Math & Stats Department
Chairperson: Gillian Mimmack *(Curriculum Committee)*
Department Head: Gillian Mimmack
Dean: Jacalyn Snodgrass
PAC Approval in Principle Date:
PAC Final Approval Date: April 29, 2005

LEARNING OBJECTIVES / GOALS / OUTCOMES / LEARNING OUTCOMES:

Successful students will be able to:
1. use transformations of discrete and continuous random variables to find the distributions of functions of several variables,
2. use moment generating functions to find distributions of functions of several variables,
3. establish the relationships between gamma and beta, normal, chi-squared and t, and chi-squared and F distributions,
4. find the distributions of the maximum, minimum and the i-th order statistic of a random sample,
5. derive and use the distributions of the sample mean and sample variance when the sample comes from a normal distribution,
6. prove the convergence in distribution and in probability of some theoretical results,
7. apply the Central Limit Theorem to problems involving sumsof independent and identically distributed random variables,
8. find unbiased estimators, consistent estimators and estimators using the method of maximum likelihood and the method of moments,
9. derive the formulae for confidence intervals for means and for differences of means,
10. determine the critical region, power function and p-value of a test of statistical hypotheses, and
11. find the complete and sufficient statistic for an unknown parameter.

METHODS:

Lectures

PRIOR LEARNING ASSESSMENT RECOGNITION (PLAR):

Credit can be awarded for this course through PLAR (Please check:) ☒ Yes ☐ No

METHODS OF OBTAINING PLAR:

Course challenge. Please check online at http://www.ucfv.ca/math/challenge.htm for the departmental challenge policy.

TEXTBOOKS, REFERENCES, MATERIALS:

[Textbook selection varies by instructor. An example of texts for this course might be:]

The text is chosen by a departmental curriculum committee.
Recommended texts are:

Hogg, R.V., McKean, J.W. and Craig, A.T. Introduction to Mathematical Statistics (sixth edition).
Hogg, R.V. and Tanis, E.A. Probability and Statistical Inference.
Kalbfleisch, J.G. Probability and Statistical Inference, Volume 2: Statistical Inference.

SUPPLIES / MATERIALS:

STUDENT EVALUATION:

[An example of student evaluation for this course might be:]

Assignments	20%
Midterm Tests	40%
Final Exam	40%

Students must achieve at least 40% on the final exam in order to receive credit for this course.

COURSE CONTENT:

[Course content varies by instructor. An example of course content might be:]

1. Brief review of probability and distributions: conditional probability, independence, Bayes' theorem, Chebyshev's inequality, joint, marginal and conditional distributions, conditional expectation, correlation coefficient and special distributions such as binomial, Poisson, gamma, chi-squared, normal and bivariate normal.

2. Distributions of functions of random variables: sampling theory, transformations of discrete random variables, transformations of continuous random variables, beta, t and F distributions, extensions of the change-of-variable technique, distributions of order statistics, the moment generating function technique, distributions of the sample mean and sample variance, expectations of functions of random variables and the multivariate normal distribution.

3. Limiting distributions: convergence in distribution, convergence in probability, limiting moment generating functions, the Law of

Large Numbers and the Central Limit Theorem.

4. Introduction to statistical inference: point estimation, unbiased estimators, consistent estimators, method of maximum likelihood, invariance property, method of moments, confidence intervals for means, confidence intervals for differences of means, tests of statistical hypotheses, critical region, power function, p-value and chi-squared tests.

5. Sufficient statistics: unbiased minimum variance estimators, minimax principle, minimum mean-square-error estimators, sufficient statistics and their properties, completeness and uniqueness, the exponential class of probability density functions, minimal sufficient and ancillary statistics.