OFFICIAL UNDERGRADUATE COURSE OUTLINE (page 1)

UNIVERSITY OF THE FRASER VALLEY

COURSE IMPLEMENTATION DATE:	July 1994
COURSE REVISED IMPLEMENTATION DATE:	January 2013
COURSE TO BE REVIEWED:	September 2009
(six years after UEC approval)	*(month, year)*

OFFICIAL UNDERGRADUATE 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 – see course syllabus available from instructor

STAT 450	SCIENCE/MATHEMATICS & STATISTICS	3
COURSE NAME/NUMBER	FACULTY/DEPARTMENT	UFV 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.

Note: This course is offered as STAT 450 and MATH 450. Students may only take one of these for credit.

PREREQUISITES: STAT 370/MATH 370
COREQUISITES:
PRE or COREQUISITES:

SYNONYMOUS COURSE(S):
(a) Replaces:
(b) Cross-listed with: **MATH 450**
(c) Cannot take: **MATH 450** for further credit.

SERVICE COURSE TO: *(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:

OTHER:
Maximum enrolment: **36**
Expected frequency of course offerings: Every second year
(every semester, annually, every other year, etc.)

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

Course designer(s): **Math and Stats Department**

Department Head:	**Gillian Mimmack**	Date approved:	**March 5, 2012**
Supporting area consultation (Pre-UEC)		Date of meeting:	**March 30, 2012**
Curriculum Committee chair:	**Gillian Mimmack**	Date approved:	**April 20, 2012**
Dean/Associate VP:	**Jacalyn Snodgrass**	Date approved:	**May 4, 2012**
Undergraduate Education Committee (UEC) approval		Date of meeting:	**May 23, 2012**

LEARNING OUTCOMES:

Upon successful completion of this course, 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 sums of 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: *(Guest lecturers, presentations, online instruction, field trips, etc.)*

Lectures.

METHODS OF OBTAINING PRIOR LEARNING ASSESSMENT RECOGNITION (PLAR):

☐ Examination(s) ☐ Portfolio assessment ☐ Interview(s)

☒ Other (specify): Course Challenge; see PLAR policy (94) at http://ufv.ca/secretariat/policies/

☐ PLAR cannot be awarded for this course for the following reason(s):

TEXTBOOKS, REFERENCES, MATERIALS: *[Textbook selection varies by instructor. Examples 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.