UNIVERSITY OF THE FRASER VALLEY

OFFICIAL UNDERGRADUATE COURSE OUTLINE (page 1)

COURSE IMPLEMENTATION DATE:	May 2005
COURSE REVISED IMPLEMENTATION DATE:	January 2012
COURSE TO BE REVIEWED:	November 2017
(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

MATH 370	Science/Mathematics & Statistics	3
COURSE NAME/NUMBER	FACULTY/DEPARTMENT	UFV CREDITS

Probability and Stochastic Processes
COURSE DESCRIPTIVE TITLE

CALENDAR DESCRIPTION:

This course covers the theory of probability and stochastic processes for science and mathematics students who have experience with third semester calculus. Topics include probability space, conditional probability and independence, continuous and discrete random variables, jointly distributed random variables, expectation, conditional expectation and properties, limit theorems, Markov chains and Poisson processes, and simulation.

PREREQUISITES: MATH 211
COREQUISITES:
PRE or COREQUISITES:

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

SERVICE COURSE TO: *(department/program)*

TOTAL HOURS PER TERM: 45

STRUCTURE OF HOURS:

Lectures:	45	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: Once a 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):	**Ali Reza Fotouhi**		
Department Head:	**Greg Schlitt**	Date approved:	**December 1, 2010**
Supporting area consultation (Pre-UEC)		Date of meeting:	**October 7, 2011**
Curriculum Committee chair:	**Norm Taylor**	Date approved:	**October 21, 2011**
Dean/Associate VP:	**Ora Steyn**	Date approved:	**November 4, 2011**
Undergraduate Education Committee (UEC) approval		Date of meeting:	**November 25, 2011**

LEARNING OUTCOMES:

Upon successful completion of this course, students will be able to:

1. construct an equally likely probability model and calculate the probability of an event by using counting techniques.
2. construct a probability model and investigate the properties of probability considering probability as a set function.
3. construct conditional probability models, investigate the independence of events, and use Bayes' formula.
4. formulate problems related to probability in real life using random variables and distributions of random variables.
5. investigate relationships between random variables that explain processes in applications.
6. calculate joint and conditional distributions, distributions of functions of random variables, and distributions of order statistics.
7. compute expectation, covariance, variance, correlation, conditional expectations and use properties of these quantities.
8. find moment generating functions and joint moment generating functions and use their properties.
9. apply the law of large numbers and some important inequalities such as Chebyshev's inequality.
10. use Markov chains and Poisson processes to solve simple problems.
11. simulate data from continuous and discrete distributions.

METHODS: *(Guest lecturers, presentations, online instruction, field trips, etc.)*

Classroom lectures. Evaluation includes assignments, tests, and a three-hour comprehensive examination.

METHODS OF OBTAINING PRIOR LEARNING ASSESSMENT RECOGNITION (PLAR):

☐ Examination(s) ☐ Portfolio assessment ☐ Interview(s) ☒ Other (specify): Course challenge

☐ 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:
Sheldon Ross. A First Course in Probability. 8th edition.
Sheldon Ross. Introduction to Probability Models.
Saeed Ghahramani. Fundamentals of Probability with Stochastis Process, third edition.

SUPPLIES / MATERIALS:

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

The weighting of the components may vary amongst instructors and years. There have to be at least two tests. The final examination has to be comprehensive and worth 40 to 50%. Students must obtain at least 40% on the final exam to pass the course.

A typical breakdown is as follows:

Assignments	20%
Term tests	35%
Final exam	45%

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

Probability: Equally likely probability models, counting methods, axioms of probability, probability space, probability as a continuous set function, conditional probabilities, Bayes' formula, independent events.

Continuous and Discrete Random Variables: Random variables, discrete random variables, important discrete random variables (uniform, Bernoulli, binomial, Poisson, geometric, negative binomial, hypergeometric), continuous random variables, important continuous random variables (uniform, exponential, gamma, chi square, normal, Cauchy, beta).

Jointly Distributed Random Variables: Joint distribution functions, independent random variables, sums of independent random variables, conditional distributions for discrete and continuous random variables, probability distributions of functions of random variables, order statistics, t and F distributions, bivariate normal distributions.

Expectation and Properties: Definition of expectation, covariance, variance, correlation, expectations and variances of important random variables, conditional expectations and properties thereof, moment generating functions and properties thereof, joint moment generating functions and properties thereof.

Limit Theorems: Chebyshev's inequality, weak law of large numbers, central limit theorem, strong law of large numbers.

Markov Chains and Poisson Processes: Markov chains, Poisson processes, surprise, uncertainty, entropy.