UNIVERSITY COLLEGE of the FRASER VALLEY

COURSE IMPLEMENTATION DATE:	September 1993
COURSE REVISED IMPLEMENTATION DATE:	
COURSE TO BE REVIEWED: (Four years after implementation date)	September 1997 (MONTH YEAR format)

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: **MATHEMATICS**

COURSE NAME/NUMBER	FORMER COURSE NUMBER	UCFV CREDITS
MATH 302		**4**

ANALYSIS OF EXPERIMENTAL AND OBSERVATIONAL DATA
COURSE DESCRIPTIVE TITLE

CALENDAR DESCRIPTION:

A practical course on the use and understanding of linear models, based on a major statistical software package. The emphasis throughout is on the construction and interpretation of simple linear models used to represent observational points fairly near the overall mean; and on understanding which model represents the alternate hypothesis and what restriction of this model represents the null hypothesis.

PREREQUISITES: **Math 106, or Math 270, or Math 104 with a grade of at least B-, or permission of the department**

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: **75**

STRUCTURE OF HOURS:

Lectures:	**45**	Hrs
Seminar:		Hrs
Laboratory:	**30**	Hrs
Field Experience:		Hrs
Student Directed Learning:		Hrs
Other (Specify):		Hrs

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

MAXIMUM ENROLLMENT:
EXPECTED FREQUENCY OF COURSE OFFERINGS:

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): ______ Chairperson: ______ *(Curriculum Committee)*

Department Head: Barry Garner Dean: ______

PAC Approval in Principle Date: PAC Final Approval Date: October 27, 1993

LEARNING OBJECTIVES / GOALS / OUTCOMES / LEARNING OUTCOMES:

The course is designed to enable students to:

1. Understand the application of the simple mathematical linear model to the variety of practical problems encountered during the course;
2. Understand the ubiquity of the linear model in classical statistics;
3. Have some appreciation of the limitations of such models, especially for values distant from the means;
4. Be confident in their own use of computer software to implement these techniques;
5. Complete a simple personal research project applying at least one of the methods learnt during the course to the solution of a real-data problem.

METHODS:

PRIOR LEARNING ASSESSMENT RECOGNITION (PLAR):

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

METHODS OF OBTAINING PLAR:

TEXTBOOKS, REFERENCES, MATERIALS:

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

Kleinbaum/Kupper/Muller, Applied regression analysis (2nd edition), Prentice-Hall

SUPPLIES / MATERIALS:

STUDENT EVALUATION:

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

Project	10%
Assignments	20%
In-class tests	30%
Final Examination	40%

COURSE CONTENT:

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

Introduction to regression: review of simple linear least-squares regression. Multiple linear regression, explanation of the software output, interpretation of the estimated equation, the coefficient of determination, inference for coefficients, the residual variance, prediction means, prediction points, the ANOVA table, the appropriate degrees of freedom (DF), the sequential sums of squares, F-tests.

Checking assumptions: examination of residuals, Q-Q plots, outliers, points of influence, auto-correlation. Approximate means and variances. Approximate transformations to normality.

Correlation: test that the (partial) correlation coefficient is zero. Discussion of Fisher's z-transform.

Indicators: Use of indicator or dummy variables to represent categories.

The one-way experimental design: application of multiple regression to the analysis of one-way experimental designs. The problem of multiple comparisons. Discussion of the Scheffe, Tukey and Bonnferroni methods Test of linearity when multiple observations are available at each 'x' value.

The general linear model: review of matrix notation, vectors, transpose, transpose of products. In matrix notation, the general linear model, the normal equations, the sum of squares and its partitioning.

Simple experimental designs: paired experimental designs. The randomized block design; its purpose and analysis. The two-way factorial design; the additive model; interaction; replication. The interpretation of interaction. The unbalanced two-way design. Comparison of simple regression lines. Simple analysis of covariance in one-way designs; adjusted means, and related inference.

Frequency data: analyses of frequency data by weighted regression (the GSK approach) using asymptotic chi-squared approximations. The test for assigned probabilities, the test for independence in contingency tables, correlated binomials, McNemar's test. Simple test of an assigned distribution, based on grouped data, the goodness-of-fit test. Logistic regression. The chi-square index of dispersion for Poisson or binomial data.

Ranking methods: replacement of observations by comparative ranks, use of standard least square methods using estimate of residual variance under null hypothesis, leading to the Mann-Whitney and Kruskall-Wallis asymptotic approximations. The Wilcoxon paired rank test.