UNIVERSITY COLLEGE of the FRASER VALLEY

COURSE IMPLEMENTATION DATE: January 2005
COURSE REVISED IMPLEMENTATION DATE:
COURSE TO BE REVIEWED: January 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 315		**3**
COURSE NAME/NUMBER	FORMER COURSE NUMBER	UCFV CREDITS

Applied Regression Analysis
COURSE DESCRIPTIVE TITLE

CALENDAR DESCRIPTION:

This is a practical course on the use and understanding of linear regression analysis. A statistical computer package such as MINITAB (or S-plus or SAS) software is used throughout the course. Topics include the method of least squares, the analysis of variance table, F tests, selection of predictor variables, diagnostics, remedial measures and validation, qualitative predictor variables, the comparison of regression models, the analysis of covariance, nonparametric regression, introduction to nonlinear regression analysis, and logistic regression. Students complete at least one group project using a real data set.

Note: Students cannot obtain credit for both MATH 315 and MATH 302.

PREREQUISITES: **MATH 104 with a B+ or better, or MATH 106 with a B or better, or MATH 270**
COREQUISITES:

SYNONYMOUS COURSE(S)
(a) Replaces: _____ *(Course #)*
(b) Cannot take: **MATH 302** *(Course #)* for further credit.

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

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

Lectures:	**30**	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: **36**
EXPECTED FREQUENCY OF COURSE OFFERINGS: **Every Winter semester**

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): Ali Reza Fotouhi
Chairperson: Gillian Mimmack *(Curriculum Committee)*
Department Head: Gillian Mimmack
Dean: Jacalyn Snodgrass
PAC Approval in Principle Date:
PAC Final Approval Date: December 10, 2004

LEARNING OBJECTIVES / GOALS / OUTCOMES / LEARNING OUTCOMES:

The successful student will be able to:

1. use computer software to obtain and interpret printouts for linear regression and logistic regression;
2. construct an appropriate regression model when the data points are fairly near the overall mean in order to estimate future values;
3. check the validity of the assumptions of the model and apply the associated remedial measures;
4. use appropriate F tests in fitting regression models;
5. select appropriate predictor variables;
6. identify outliers, influential readings and problems with multicollinearity and apply the appropriate remedial measures;
7. define and use indicator variables in regression models;
8. interpret estimates, parameters, sequential sums of squares and interactions between predictor variables;
9. construct an appropriate regression model when the response variable is binary;
10. complete at least one group project which entails solving a problem by applying the techniques learned during the course to real data.

METHODS:

Lectures, class discussion, use of statistical software in computing labs.

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 textbook is chosen by a departmental curriculum committee. Recommended textbooks are:

Neter et al. Applied Linear Statistical Models. 4th edition. McGraw-Hill.
Douglas C. Montgomery et al. Introduction to Linear Regression Analysis. 3rd ediction. John Wiley & Sons, Inc.
Kleinbaum et al. Applied Regression Analysis and Multivariable Methods. 3rd edition. Duxbury.

SUPPLIES / MATERIALS:

STUDENT EVALUATION:

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

Project	15%
Assignments	15%
In-class tests	30%
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:]

An internationally recognized statistical software package is used throughout the course.

1. Simple Linear Regression:
   Method of least squares, regression models with normally distributed error, inference for parameters, inference for the response function and new observations, diagnostics and remedial measures, lack of fit test, simultaneous estimation of mean responses, and simultaneous prediction intervals for new observations.

2. Multiple Linear Regression:
   General linear regression models, estimation of regression coefficients, fitted values and residuals, analysis of variance, inference for regression parameters, estimation of mean response and prediction of new observations, diagnostics and remedial measures, extra sums of squares and their uses, coefficient prediction of partial determination and coefficient of

partial correlation, standardized multiple regression model, multicollinearity and its effects, polynomial regression models, and interaction terms in regression models.

3. Selection of Predictor Variables:
   All possible regression procedures for variable selection, forward stepwise regression, forward selection, and backward elimination.

4. Diagnostics:
   Identifying outlying Y observations, identifying outlying X observations, identifying influential cases (DFFITS, DFBETAS, Cook's distance), multicollinearity, and variance inflation factors.

5. Remedial Measures and Validation:
   Remedial measures for unequal error variances (weighted least squares), remedial measures for multicollinearity (Ridge regression), remedial measures for influential cases (robust regression), remedial measures for unknown response function (nonparametric regression), and model validation.

6. Qualitative Predictor Variables:
   Use of indicator or dummy variables to represent qualitative data, models with interaction terms, and comparison of two or more regression functions.

7. Introduction to Non-Linear Regression:
   Least squares estimation in nonlinear regression, regression models with binary response variables, simple logistic regression functions, simple logistic regression, the maximum likelihood method, selection of predictor variables, diagnostics, inference in logistic regression, regression parameters and mean response, prediction of new observations, the odds ratio, comparison of nested models, and goodness of fit tests.