ORIGINAL COURSE IMPLEMENTATION DATE: January 2005
REVISED COURSE IMPLEMENTATION DATE: September 2022
COURSE TO BE REVIEWED (six years after UEC approval)**:** February 2027
Course outline form version: 05/18/2018

OFFICIAL UNDERGRADUATE COURSE OUTLINE FORM

Note: The University reserves the right to amend course outlines as needed without notice.

Course Code and Number: STAT 315	**Number of Credits:** 3 Course credit policy (105)

Course Full Title: Applied Regression Analysis
Course Short Title:
(Transcripts only display 30 characters. Departments may recommend a short title if one is needed. If left blank, one will be assigned.)

Faculty: Faculty of Science	**Department (or program if no department):** Mathematics and Statistics

Calendar Description:

Focuses on application of regression using statistical software. Topics include multiple regression, model building, screening methods, residual analysis, validation, analysis of covariance, splines, ridge, robust, nonparametric, and nonlinear regressions.

Prerequisites (or NONE):	STAT 270 or STAT 271.
Corequisites (if applicable, or NONE):	
Pre/corequisites (if applicable, or NONE):	

Antirequisite Courses *(Cannot be taken for additional credit.)*
Former course code/number: **MATH 315**
Cross-listed with:
Dual-listed with:
Equivalent course(s):
(If offered in the previous five years, antirequisite course(s) will be included in the calendar description as a note that students with credit for the antirequisite course(s) cannot take this course for further credit.)

Typical Structure of Instructional Hours

Lecture/seminar hours	
Tutorials/workshops	
Supervised laboratory hours	50
Experiential (field experience, practicum, internship, etc.)	
Supervised online activities	
Other contact hours:	
Total hours	**50**

Labs to be scheduled independent of lecture hours: ☒ No ☐ Yes

Special Topics *(Double-click on boxes to select.)*
This course is offered with different topics:
☒ No ☐ Yes *(If yes, topic will be recorded when offered.)*

Independent Study
If offered as an Independent Study course, this course may be repeated for further credit: *(If yes, topic will be recorded.)*
☒ No ☐ Yes, repeat(s) ☐ Yes, no limit

Transfer Credit
Transfer credit already exists: *(See **bctransferguide.ca**.)*
☐ No ☒ Yes
Submit outline for (re)articulation:
☒ No ☐ Yes *(If yes, fill in transfer credit form.)*

Grading System
☒ Letter Grades ☐ Credit/No Credit

Maximum enrolment (for information only): 36
Expected Frequency of Course Offerings: Every year

Department / Program Head or Director: Ian Affleck	**Date approved:**	June 15, 2020
Faculty Council approval	**Date approved:**	September 11, 2020
Dean/Associate VP:	**Date approved:**	September 11, 2020
Campus-Wide Consultation (CWC)	**Date of posting:**	February 5, 2021
Undergraduate Education Committee (UEC) approval	**Date of meeting:**	February 26, 2021

Learning Outcomes:

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

1. Construct an appropriate regression model when the data points are fairly near the overall mean in order to estimate the predictors' effect and predict future response values.
2. Check the validity of the assumptions of the model and apply the associated remedial measures.
3. Use appropriate significance tests and confidence intervals in fitting regression models.
4. Select appropriate predictor variables.
5. Identify outliers, influential observations and problems with multicollinearity and apply the appropriate remedial measures.
6. Define and use indicator variables in regression models.
7. Interpret estimates, parameters, different types of sums of squares and interactions between predictor variables.
8. Construct an appropriate regression model when the response variable is binary.
9. Identify autocorrelated errors and fit regression models when errors are autocorrelated.
10. Perform model validation for future prediction and inverse estimation of predictor.
11. Use computer software to obtain and interpret printouts.

Prior Learning Assessment and Recognition (PLAR)

☒ Yes ☐ No, PLAR cannot be awarded for this course because

Typical Instructional Methods *(Guest lecturers, presentations, online instruction, field trips, etc.; may vary at department's discretion.)*

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

NOTE: The following sections may vary by instructor. Please see course syllabus available from the instructor.

Typical Text(s) and Resource Materials *(If more space is required, download Supplemental Texts and Resource Materials form.)*

	Author (surname, initials)	Title (article, book, journal, etc.)	Current ed.	Publisher	Year
1.	Mendenhall, W and Sincich, T	A second course in statistics: Regression Analysis	☒	Pearson	2020
2.	Neter et al	Applied Linear Statistical Models. 4th edition	☐	McGraw-Hill.	
3.	Douglas C. Montgomery et al	Introduction to Linear Regression Analysis. 5th edition	☐	John Wiley & Sons	
4.	Sheather, Simon J.	A Modern Approach to Regression with R.		Springer	2009

Typical Evaluation Methods and Weighting

Final exam:	50%	Assignments:	10%	Field experience:	%	Portfolio:	%
Midterm exam:	30%	Project:	10%	Practicum:	%	Other:	%
Quizzes/tests:	%	Lab work:	%	Shop work:	%	Total:	100%

Details (if necessary):

The above percentages may vary among instructors and years. Students must achieve at least 40% on the final exam in order to receive credit for this course.

Typical Course Content and Topics

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.
8. **Two topics in the use of regression analysis:** Regression models with autocorrelated errors, detecting the presence of autocorrelation, parameter estimation methods when autocorrelation is present, inverse estimation, and the calibration problem.