DALHOUSIE UNIVERSITY

Faculty of Science Course Syllabus
Department of Mathematics and Statistics
Regression and Analysis of Variance STAT 3340/MATH 3340 (online)
Fall 2020

Instructor: Joanna Mills Flemming Joanna.Flemming@Dal.Ca

Lectures: Approximately 3 video lectures per week - ***Asynchronous***

Tutorial: W 11:35-12:35 - ***Synchronous***

Course Description

A thorough treatment of the theory and practice of regression analysis. Topics include: fitting general linear models using matrices, optimality of least squares estimators (Gauss-Markov theorem), inferences, simple and partial correlation, analysis of residuals, case-deletion diagnostics, polynomial regression, transformations, use of indicator variables for analysis of variance and covariance problems, model selection, and an introduction to nonlinear least squares. This course makes extensive use of the state-of-the-art open-source statistical software package R.

Course Prerequisites

Math 1030 and STAT 2060 (or MATH 2060) and STAT 2080 (or MATH 2080 or ECON 3338) and STAT 2450. STAT 2450 can also be taken as a corequisite.

Learning Objectives

1. Perform least-squares estimation, hypothesis testing and interval estimation for simple linear regression models by hand and using R.
2. Perform least-squares estimation, hypothesis testing and interval estimation for multiple linear regression models using R.
3. Perform estimation by maximum likelihood and predict new observations using R.
4. Check model adequacy via residual analysis, detection and treatment of outliers and tests for lack of fit.
5. Employ transformations and weighting to correct model inadequacies.
6. Explore diagnostics for leverage and influence.
7. Understand and be able to address multicollinearity.
8. Select variables and build models using computational techniques.
9. ANOVA.
10. Modern regression approaches. *[Time Permitting]*

Course Materials

1. There is a BrightSpace site for this course. This is where announcements and assessment information will be posted. Students are encouraged to use the discussion board for questions. The Brightspace site also contains a link to the course space on the LON-CAPA (Learning Online Network with Computer-Assisted Personalize Approach) e-learning software server, where statistical tables and assessments can be found.
2. Recommended text: Introduction to Linear Regression Analysis, Fifth Edition, Montgomery, Peck and Vining.

3. Most assessments (assignments and quizzes) will require use of the state-of-the-art open-source statistical software package R. You can download the software at www.r-project.org for Mac OS, Windows and Linux.

Course Assessment

Component	Weight (% of final grade)	Date
Assignments	*5 for a total of 50%*	*Sep 18; Oct 2, 16 and 30; Nov 20.*
Quizzes	*5 for a total of 25%*	*Sep 25; Oct 9 and 23; Nov 6 and 27.*
Final Project	*25%*	*Dec 11.*

Conversion of numerical grades to Final Letter Grades follows the Dalhousie Common Grade Scale

A+ (90-100)	B+ (77-79)	C+ (65-69)	D	(50-54)
A (85-89)	B (73-76)	C (60-64)	F	(<50)
A- (80-84)	B- (70-72)	C- (55-59)		

Course Policies

Late assessments will not be accepted.

Missed or Late Academic Requirements due to Student Absence:

Late assessments will not be accepted. As per Senate decision medical notes will not be required of students who miss an assessment, but a Student Declaration of Absence must still be completed or a grade of 0 will be assigned. Information on regular policy, including the use of the Student Declaration of Absence can be found here:https://www.dal.ca/dept/university_secretariat/policies/academic/missed-or-late-academic-requirements-due-to-student-absence.html.

***Academic Integrity**:*

At Dalhousie University, we are guided in all of our work by the values of academic integrity: honesty, trust, fairness, responsibility and respect (The Center for Academic Integrity, Duke University, 1999). As a student, you are required to demonstrate these values in all of the work you do. The University provides policies and procedures that every member of the university community is required to follow to ensure academic integrity. Information: https://www.dal.ca/dept/university_secretariat/academic-integrity.html

Students will be assigned to groups for the project but must complete all other course assessments independently.

Course Content

Simple Linear Regression	Var. Selection & Model Building	Special types of Regression: Polynomial, Indicator Variables, Nonlinear
Multiple Linear Regression	Transformations & Weighting	ANOVA
Model Checking and Diagnostics	Multicollinearity	Modern Regression Techniques