Department of Mathematics & Statistics
Concordia University

STAT 360
Linear Models
Summer 2020

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Office Hours: Tuesdays, 11:00-13:00, Online via Zoom link (refer course Moodle page).

Preface: Due to exceptional circumstances, this course will be taught and all assessments will be done completely ONLINE. Given the subject matter and nature of this course, at least one of the exams, including **the class tests and/or the final exam will be given online through the Concordia Online Exams (COLE) platform with online proctoring.** For more details read the ADDENDUM at the end of this Course Outline.

Text: *Applied Linear Regression* Models, 4th Edition, by Kutner, Nachtsheim and Neter, McGraw Hill-Irwin, 2004.

Calculators: Only calculators approved by the Department (with a sticker attached as a proof of approval), such as **Sharp EL 531** or the **Casio FX 300MS**, available at the Concordia Bookstore, are permitted for the class test and final examination. See http://www.concordia.ca/artsci/math-stats/services.html#calculators for details.

Software: **R** (a software environment and language for statistical computing and graphics, https://www.r-project.org/)

Assignments: Assignments are compulsory. Assignments are given for every week. There be 4 assignments. Most of the assignments will involve use of the software **R** that will be demonstrated during online lecture. **R** can be freely downloaded and installed from http://www.r-project.org. Students are expected to submit electronic assignments as a PDF files through **Moodle**. **Late assignments will not be accepted.**

Tests: Two online tests/quizzes will be held on **Wednesday May 20 and June 3** proctored by COLE and/or Moodle platform (See Addendum). These tests will be held for 1 hour each during online lecture time. These exams as well as the final, will be closed book exams.

Final Grade:

a) Assignments (15%)
b) Two class tests (30%)
c) Final examination (55%)

If the grading scheme for this course includes graded assignments, a reasonable and representative subset of each assignment may be graded. Students will not be told in advance which subset of the assigned problems will be marked and should therefore attempt all assigned problems.

IMPORTANT: **PLEASE NOTE THAT THERE IS NO "100% FINAL EXAM" OPTION IN THIS COURSE.**

Lecture	Sections	Topics to be covered
1	1.3, 1.6, 1.7, 1.8	Simple linear regression models; estimation of regression function; estimation of error term variance; normal error regression model. **Introduction to R program.**
2	2.1, 2.2, 2.4	Estimation of $ß_0$ and $ß_1$; interval estimation of E (Y_h).
3	2.5, 2.6, 2.7	Prediction of new observation; confidence band of regression line; ANOVA approach to regression analysis.
4	2.8, 2.9, 3.2	General linear test approach; coefficient of correlation; residuals.
5	3.3, 3.7 **Class Test I**	Diagnostics for residuals; F-test for lack of fit. **Class Test I** will cover material up to Section **3.2**
6	4.1, 4.2	Joint estimation of $ß_0$ and $ß_1$; Simultaneous estimation of mean responses.
7	4.3, 4.4, 5.6	Simultaneous prediction intervals for new observations; Regression through origin; inverse of a matrix.
8	5.8, 5.9, 5.10	Random vectors and matrices; differentiation of a vector and scalar function of n x n matrix; Simple linear regression model in the matrix form. Least square estimation of regression parameters
9	5.11, 5.12, 5.13 **Class Test II**	Fitted values and residuals; ANOVA results; inferences in regression models. **Class Test II** will cover material from Section **3.3** to section **5.10.**
10	6.1, 6.2, 6.3	Multiple linear regression models; general linear regression model in matrix terms; estimation of regression coefficients.
11	6.4 – 6.7, 6.8, 6.9	Fitted values and residuals; ANOVA results; inferences about regression parameters; inferences about mean response and prediction of new observation; diagnostics and remedial Measures.
12	7.1, 7.2, 7.3	Extra sum of squares; application of extra sum of squares; tests concerning regression coefficients.
13	7.4, 7.5, 7.6; **Review**	Coefficient of partial determination; standardized multiple regression models; multicollinearity and its effects.

Academic Integrity and the Academic Code of Conduct

This course is governed by Concordia University's policies on Academic Integrity and the Academic Code of Conduct as set forth in the Undergraduate Calendar and the Graduate Calendar. Students are expected to familiarize themselves with these policies and conduct themselves accordingly. "Concordia University has several resources available to students to better understand and uphold academic integrity. Concordia's website on academic integrity can be found at the following address, which also includes links to each Faculty and the School of Graduate Studies: concordia.ca/students/academic-integrity." *[Undergraduate Calendar, Sec 17.10.2]*

Addendum: Due to exceptional circumstances, this course will be taught and all assessments will be done completely online. Given the subject matter and nature of this course, a midterm and/or a final online exam will be provided through the Concordia Online Exams (COLE) platform with online proctoring. More information about this may be found at the COLE website.

Please note the following respect to online proctored exams:

- That the exam will take place during the exam period at the designated date and time set by the professor (midterm) or the Exams Office (final). All exam times will be set to Eastern Standard Time.
- That your image, voice and screen activity may be recorded throughout the duration of the exam.
- That you must show your Concordia University Identification card to validate your identity. Alternative government issued photo identification will be accepted, though it is not recommended. Only identification in English or French will be accepted.
- That the recording will be encrypted and will only be viewed by authorized university personnel (no external entity has authorization to review the recording).
- That you will be responsible for ensuring appropriate properly functioning technology (webcam, a microphone, Chrome browser and an ability to download the Proctorio extension, as well as a reliable internet connection with a minimum of a 3G connection).
- That you should enter the virtual test site and become familiar with the software that will be used for their exam before starting the exam.
- That you will need a quiet place within which to take the exam. Earplugs or noise- cancelling headphones that are not connected to a device may also be used to allow you to focus for the duration of the exam.

Students who are unable to write an exam because they are unable to meet the above conditions and requirements are advised that they will need to drop the course. More information can be provided on the next offering of this course by consulting the Department. Students are advised that the drop deadline (DNE) for this course is May 11.

Students who require additional accommodations for their exams due to a documented disability should contact the Access Centre for Students with Disabilities as soon as possible. If you face issues during the exam, you should inform your professor of those issues immediately. Please note that there are in-exam supports you should spend time getting to know. Visit the COLE website for more information.