**Department of Mathematics & Statistics**
**Concordia University**

# STAT 360
Linear Models
***Fall 2025***

**Instructor:** Dr. D. Sen
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**Class Schedule:** Tuesdays and Thursdays, 13:15-14:30.

**Mid-term Break:** There will be a mid-term break from October 11 to October 17.

**Office Hours:** Tuesdays, 11:00-12:30.

**Text:** *Applied Linear Regression Models,* 4th Edition, by Kutner, Nachtsheim and Neter, McGraw Hill-Irwin, 2004.
The hard-copy text can be purchased at the Concordia bookstore, https://www.bkstr.com/concordiastore/home.
Note: Students should order textbooks as early as possible, especially for printed versions in case books are backordered or there are any shipping delays.

**Assignments:** There will be 5 assignments. Assignments are compulsory. Students are expected to submit electronic assignments as a PDF file through Moodle. **Late assignments will not be accepted.** Assignments contribute 15% to your final grade. Working regularly on the assignments is essential for success in this course.

**Calculators:** Only calculators approved by the Department (with a sticker attached as proof of approval) are permitted for the class test and final examination.
For a list of Approved calculators see
https://www.concordia.ca/artsci/math-stats/services.html#calculators

**Midterm Test:** There will be one **midterm test,** based on the material of lectures 1-6. The midterm test will be held on **Tuesday October 21, 2025, in class.** This exam, as well as the final, will be closed book exams.

**NOTE:** It is the Department's policy that tests missed for any reason, **including illness,** cannot be made up. Students who are unable to write the midterm test for a valid reason must write to their instructor to request a 85% final exam. Such a request will not be granted unless it is made in writing (by email), the reason is valid and is supported by documentation or other evidence. Valid reasons for missing a midterm

test include: conflicts with other exams or religious observances (must be reported to the instructor in advance); illness (Short-Term Absence form or valid medical note required); bereavement. Students who miss the midterm test but do not request a 85% final, as described above, will forfeit the marks for the midterm test.

**Final Exam:** The final examination will be three hours long and will cover all the material in the course. To obtain a good grade, the student **MUST** show that she/he has a THOROUGH understanding of the subject and is good at problem-solving.

**PLEASE NOTE: Students** are responsible for finding out the date and time of the final exams once the schedule is posted by the Examinations Office. Conflicts or problems with the scheduling of the final exam must be reported directly to **the Examinations Office**, **not to your instructor**. It is the Department's policy and the Examinations Office's policy that **students are to be available until the end of the final exam period. Conflicts due to travel plans will not be accommodated.**

**Final Grade:** The final grade will be based on the higher of (a) or (b) below:

a) Assignments (15%)
Mid-term test (25%)
Final examination (60%)

b) Assignments (15%)
Mid-term test (15%)
Final examination (70%)

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.**

| Lectures | 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. |
| 2 | 2.1, 2.2, 2.4 | Inferences concerning $\beta_1$ and $\beta_0$; interval estimation of E ($Y_h$). |
| 3 | 2.5, 2.6, 2.7, 2.8 | Prediction of new observation; confidence band for regression line; ANOVA approach to regression analysis.; General linear test approach. |
| 4 | 2.9, 3.1, 3.2, 3.3, 3.4 | Descriptive measures of linear association between X and Y; Diagnostics for predictor variable; residuals; Diagnostic for residuals; Overview of tests involving residuals. |
| 5 | 3.7, 4.1, 4.2, 4.3, 4.4 | F-test for lack of fit; Joint estimation of $\beta_0$ and $\beta$, Simultaneous estimation of mean responses; simultaneous prediction intervals for new observations; regression through origin. |

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|---|---|---|
| 6 | 5.1, 5.2, 5.3, 5.4, 5.5, 5.6, 5.8 | Matrices; Matrix Addition; Subtraction; Matrix multiplication, special Types of Matrices; Linear Dependence and Rank; Inverse of a matrix; random vectors and matrices. |
| 7 | **MID-TERM**<br>5.9, 5.10 | **Mid Term exam will cover material up to section 5.8**.<br>simple linear regression model in matrix terms, least square estimation of regression parameters. |
| 8 | 5.11, 5.12, 5.13 | Fitted values and residuals; ANOVA results; inferences in regression analysis. |
| 9 | 6.1, 6.2, 6.3 | Multiple regression models; general linear regression model in matrix terms; estimation of regression coefficients. |
| 10 | 6.4, 6.5, 6.6, 6.7 | Fitted values and residuals; ANOVA results; inferences about regression parameters; estimation of mean response and prediction of new observation. |
| 11 | 6.8, 6.9, 7.1, 7.2 | Diagnostics and remedial measures; multiple regression with two predictor variables; Extra sum of squares & its application; Uses of Extra Sum of squares in Tests for Regression Coefficients. |
| 12 | 7.3, 7.4, 7.5 & Review | Summary of Tests concerning regression coefficients; coefficient of partial determination; standardized multiple regression model. |

**Student Services**
You may wish to access the many services available to you as a Concordia student. An overview of these resources can be found here: https://www.concordia.ca/students/services.html

**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: https://www.concordia.ca/conduct/academic-integrity.html" *[Undergraduate Calendar, Sec 17.10.2]*

**Behaviour**
All individuals participating in courses are expected to be professional and constructive throughout the course, including in their communications.

Concordia students are subject to the Code of Rights and Responsibilities which applies both when students are physically and virtually engaged in any University activity, including classes, seminars, meetings, etc. Students engaged in university activities must respect this Code when engaging with any members of the Concordia community, including faculty, staff, and students, whether such interactions are verbal or in writing, face to face or online/virtual. Failing to comply with the Code may result in charges and sanctions, as outlined in the Code.

**Intellectual Property**
Content belonging to instructors shared in online courses, including, but not limited to, online lectures, course notes, and video recordings of classes remain the intellectual property of the faculty member. It may not be distributed, published or broadcast, in whole or in part, without the express permission of the faculty member. Students are also forbidden to use their own means of recording any elements of an online class or lecture without express permission of the instructor. Any unauthorized sharing of course content may constitute a breach of the Academic Code of Conduct and/or the Code of Rights and Responsibilities. As specified in the Policy on Intellectual Property, the University does not claim any ownership of or interest in any student IP. All university members retain copyright over their work.

**Extraordinary circumstances**
In the event of extraordinary circumstances and pursuant to the Academic Regulations the University may modify the delivery, content, structure, forum, location and/or evaluation scheme. In the event of such extraordinary circumstances, students will be informed of the change.