



UNIVERSITY OF CALGARY  
FACULTY OF SCIENCE  
DEPARTMENT OF MATHEMATICS & STATISTICS  
COURSE OUTLINE

1. **Course:** STAT 429, Linear Models and Their Applications -- Fall 2018

Instructor Name	Email	Phone	Office	Hours
L01: ( TR 15:30 - 16:45 in SA 124A)				
Bingrui Sun	cindy.bsun@ucalgary.ca	403-210-8473	MS 544	R 2-3pm

**Course Site:**

D2L: STAT 429 L01-(Fall 2018)-Linear Models Their Applctn's

**Department of Mathematics & Statistics:**

Office: MS 476  
Phone: 403 220-5210  
Email: math@ucalgary.ca

**Note:**

Students must use their U of C account for all course correspondence.

2. **Requisites:**

See section [3.5.C](#) in the Faculty of Science section of the online Calendar.

**Prerequisite(s):** Statistics 323 or Data Science 305; and Mathematics 211 or 213.

3. **Grading:**

The University policy on grading and related matters is described in [F.1](#) and [F.2](#) of the online University Calendar. In determining the overall grade in the course the following weights will be used:

Component(s)	Weighting %	Date
Midterm Examination	30%	October 30
Project (1)	25%	
Final Examination	45%	To be scheduled by the Registrar

Each piece of work (reports, assignments, quizzes, midterm exam(s) or final examination) submitted by the student will be assigned a grade. The student's grade for each component listed above will be combined with the indicated weights to produce an overall percentage for the course, which will be used to determine the course letter grade.

The conversion between a percentage grade and letter grade is as follows.

	A+	A	A-	B+	B	B-	C+	C	C-	D+	D
<b>Minimum % Required</b>	95 %	90 %	85 %	80%	75%	70 %	65 %	60%	55%	50 %	45 %

This course has a registrar scheduled final exam.

4. **Missed Components of Term Work:**

The regulations of the Faculty of Science pertaining to this matter are found in the Faculty of Science area of the Calendar in [Section 3.6](#). It is the student's responsibility to familiarize himself/herself/themself with these regulations. See also [Section E.3](#) of the University Calendar.

## 5. **Scheduled out-of-class activities:**

There are no scheduled out of class activities for this course.

## 6. **Course Materials:**

Recommended Textbook(s):

Simon J. Sheather, *A Modern Approach to Regression with R*: Springer - Verlag, New York, 2009 .

## 7. **Examination Policy:**

No aids are allowed on tests or examinations.

Students should also read the Calendar, [Section G](#), on Examinations.

## 8. **Approved Mandatory and Optional Course Supplemental Fees:**

There are no mandatory or optional course supplemental fees for this course.

## 9. **Writing across the Curriculum Statement:**

For all components of the course, in any written work, the quality of the student's writing (language, spelling, grammar, presentation etc.) can be a factor in the evaluation of the work. See also [Section E.2](#) of the University Calendar.

## 10. **Human studies statement:**

Students will not participate as subjects or researchers in human studies.

See also [Section E.5](#) of the University Calendar.

## 11. **Reappraisal of Grades:**

A student wishing a reappraisal, should first attempt to review the graded work with the Course coordinator/instructor or department offering the course. Students with sufficient academic grounds may request a reappraisal. Non-academic grounds are not relevant for grade reappraisals. Students should be aware that the grade being reappraised may be raised, lowered or remain the same. See [Section I.3](#) of the University Calendar.

1. **Term Work:** The student should present their rationale as effectively and as fully as possible to the Course coordinator/instructor within **15 days** of either being notified about the mark, or of the item's return to the class. If the student is not satisfied with the outcome, the student shall immediately submit the Reappraisal of Graded Term work form to the department in which the course is offered. The department will arrange for a re-assessment of the work if, and only if, the student has sufficient academic grounds. See sections [I.1](#) and [I.2](#) of the University Calendar
2. **Final Exam:** The student shall submit the request to Enrolment Services. See [Section I.3](#) of the University Calendar.

## 12. **OTHER IMPORTANT INFORMATION FOR STUDENTS:**

- a. **Mental Health** The University of Calgary recognizes the pivotal role that student mental health plays in physical health, social connectedness and academic success, and aspires to create a caring and supportive campus community where individuals can freely talk about mental health and receive supports when needed. We encourage you to explore the mental health resources available throughout the university community, such as counselling, self-help resources, peer support or skills-building available through the SU Wellness Centre (Room 370, MacEwan Student Centre, [Mental Health Services Website](#)) and the Campus Mental Health Strategy website ([Mental Health](#)).
- b. **SU Wellness Center:** The Students Union Wellness Centre provides health and wellness support for students including information and counselling on physical health, mental health and nutrition. For more information, see [www.ucalgary.ca/wellnesscentre](http://www.ucalgary.ca/wellnesscentre) or call [403-210-9355](tel:403-210-9355).
- c. **Sexual Violence:** The University of Calgary is committed to fostering a safe, productive learning environment. The Sexual Violence Policy (<https://www.ucalgary.ca/policies/files/policies/sexual-violence-policy.pdf>) is a fundamental element in creating and sustaining a safer campus environment for all community members. We understand that sexual violence can undermine students' academic success and we encourage students who have experienced some form of sexual misconduct to talk to someone about their experience, so they can get the support they need. The Sexual Violence Support Advocate, Carla Bertsch, can provide confidential support

and information regarding sexual violence to all members of the university community. Carla can be reached by email ([svsa@ucalgary.ca](mailto:svsa@ucalgary.ca)) or phone at [403-220-2208](tel:403-220-2208) .

- d. **Misconduct:** Academic misconduct (cheating, plagiarism, or any other form) is a very serious offence that will be dealt with rigorously in all cases. A single offence may lead to disciplinary probation or suspension or expulsion. The Faculty of Science follows a zero tolerance policy regarding dishonesty. Please read the sections of the University Calendar under [Section K](#). Student Misconduct to inform yourself of definitions, processes and penalties. Examples of academic misconduct may include: submitting or presenting work as if it were the student's own work when it is not; submitting or presenting work in one course which has also been submitted in another course without the instructor's permission; collaborating in whole or in part without prior agreement of the instructor; borrowing experimental values from others without the instructor's approval; falsification/fabrication of experimental values in a report. **These are only examples.**
- e. **Assembly Points:** In case of emergency during class time, be sure to FAMILIARIZE YOURSELF with the information on [assembly points](#).
- f. **Academic Accommodation Policy:** Students needing an accommodation because of a disability or medical condition should contact Student Accessibility Services in accordance with the procedure for accommodations for students with disabilities available at [procedure-for-accommodations-for-students-with-disabilities.pdf](#).
- Students needing an accommodation in relation to their coursework or to fulfill requirements for a graduate degree, based on a protected ground other than disability, should communicate this need, preferably in writing, to the Associate Head of the Department of Mathematics & Statistics, Jim Stallard by email [jbstall@ucalgary.ca](mailto:jbstall@ucalgary.ca) or phone 403-220-3953. Religious accommodation requests relating to class, test or exam scheduling or absences must be submitted no later than **14 days** prior to the date in question. See [Section E.4](#) of the University Calendar.
- g. **Safewalk:** Campus Security will escort individuals day or night (See the [Campus Safewalk](#) website). Call [403-220-5333](tel:403-220-5333) for assistance. Use any campus phone, emergency phone or the yellow phones located at most parking lot pay booths.
- h. **Freedom of Information and Privacy:** This course is conducted in accordance with the Freedom of Information and Protection of Privacy Act (FOIPP). Students should identify themselves on all written work by placing their name on the front page and their ID number on each subsequent page. For more information, see [Legal Services](#) website.
- i. **Student Union Information:** [VP Academic](#), Phone: [403-220-3911](tel:403-220-3911) Email: [suypaca@ucalgary.ca](mailto:suypaca@ucalgary.ca). SU Faculty Rep., Phone: [403-220-3913](tel:403-220-3913) Email: [sciencerep@su.ucalgary.ca](mailto:sciencerep@su.ucalgary.ca). Student Ombudsman, Email: [suypaca@ucalgary.ca](mailto:suypaca@ucalgary.ca).
- j. **Internet and Electronic Device Information:** Unless instructed otherwise, cell phones should be turned off during class. All communication with other individuals via laptop, tablet, smart phone or other device is prohibited during class unless specifically permitted by the instructor. Students that violate this policy may be asked to leave the classroom. Repeated violations may result in a charge of misconduct.
- k. **Surveys:** At the University of Calgary, feedback through the Universal Student Ratings of Instruction ([USRI](#)) survey and the Faculty of Science Teaching Feedback form provides valuable information to help with evaluating instruction, enhancing learning and teaching, and selecting courses. Your responses make a difference - please participate in these surveys.

**Department Approval:**

Electronically Approved

**Date:** 2018-08-30 17:30

## Course Outcomes

- Model the simple linear relationship between a response variable (Y) and an explanatory variable (X), use both numerical (T and F tests, correlation coefficient (r), coefficient of determination) and graphical (scatter plot, residual plot) methods to assess model validity. Interpret model parameters
- Use a valid simple linear regression (SLR) model to predict the response variable at a certain level of the explanatory

variable ( $X=x^*$ ). Construct confidence interval and prediction interval for the response variable ( $Y|X=x^*$ )

- Apply the Box-Cox transformation to either/both of the response variable and the predictor variable and build a valid linear model based on the transformed variable(s). Make inference of the response variable based on the new model.
- Demonstrate the weighted least squares method under the bivariate setup and make inference of the response variable based on a model fit ted using this method
- Derive some basic properties (mean and variance) of the model parameters by using the matrix algorithm
- Construct a multiple linear regression ( MLR ) line to model the relationship between a response and a cluster of predictor variables , use both numerical ( coefficient of determination, adjusted coefficient of determination , partial F test) and graphical (scatter plot, added variable plot, marginal model plot) methods to assess model validity. Interpret model parameter estimates. Construct confidence interval and prediction interval for the response variable ( $Y|X'=x'$ ). Discuss the inference scope of such regression analysis.
- Apply the Box- Cox transformation to some/all of the response variable and the predictor variables and construct a valid MLR model based on the transformed variables
- Check the multi -linearity problem of a MLR model. If there is a problem, use (i) All possible subsets and (ii) Stepwise variable selection methods to identify the most significant subset of predictor variables that contribute to the explanation of the variation in Y, by using the criterion of (i) AIC, (ii) Corrected AIC , and /or (iii) BIC. Tell the similarity and difference be tween these two variable selection methods and the advantage/disadvantage of each of the se three selection criterion.
- Form a logistic regression model to describe the relationship between a binary response variable and a set of explanatory variables , interpret model parameter estimates, and check model validity by using marginal model plots. Conduct variable selection when the response is binary
- Write technical reports for group research projects. Deliver professional presentations and discuss group research project results with the entire class audience . Provide constructive comments and suggestions to peers' assignments and presentations