Course Description:
The purpose of this course is to advance students understanding of theoretical and applied issues in econometrics. Providing students with a strong foundation to carry through with graduate level study in econometrics and learn the skills sought after in the business community. The course takes a broad approach to topics covered but will also focus on current exciting econometric issues. Students are expected to have working knowledge of some econometric software. We will also discuss prediction and classification models that are used in Data Science. By the end of the class students will have extensive experience in applying different data analysis methods, and in using experimental and nonexperimental research designs to make inferences.

Course Outcomes
Students who successfully complete this course will:

a) Know and understand the k-variable regression model, the Gauss-Markov theorem, and be able to identify and correct violations to identification and hypothesis testing.

b) Know and understand inference in a randomized controlled trial and experimental design.

c) Know and understand standard panel data models allowing for fixed effects and the differences between fixed and random effects estimators.

d) Know and understand way a randomized experiment allows for a casual interpretation of empirical results. Understand how non-experimental techniques allow for a casual interpretation of empirical results. Understand the use of instrumental variables, difference in differences, matching estimators and discontinuity in identification and estimation.

e) Know and understand the maximum likelihood estimators used in non-linear estimation and the use of generalized methods of moments estimators.

f) Be proficient in application of multi-nominal, ordered and count models.

g) Understand application of prediction, cross validation and classification models.

h) Be proficient in reporting, interpreting, and drawing policy implications from econometric results.

Course Objectives/Learning Outcomes:
The primary objective of the course is to provide students with an in depth theoretical and practical knowledge in advanced econometrics. Besides focusing on econometric theory, students will also have ‘hands-on’ experience communicating how advanced econometrics concepts are applied in academic and business settings.
Course Outline:
1. Introduction - review of statistics; confidence in intervals; power analysis

2. Inference in a randomized controlled trial (RCT) setting; experimental design; noncompliance and other problems of inference;

3. Linear regression modeling; properties of regression; omitted variables; decomposition techniques; problems of inference

4. Fixed effects; random effects; correlated random effects models

5. Non-experimental research designs I: difference in differences

6. Matching and reweighting – alternatives to regression

7. Non-experimental research designs II: instrumental variables

8. Non-experimental research designs III: regression discontinuity

9. Nonlinear models: multinomial models; logit and related models

10. Prediction, classification and regularization

12. Bootstrap and Cross-Validation

Prerequisites/corequisites:
Econ 497 starts at a level that assumes familiarity with the material covered in Econ 495 and Stats 213, including proficiency at mathematical statistics and calculus. Presentations will use matrix algebra. Computers in the Tri-Faculty computer lab (SS018) are equipped with STATA software.

Required Textbook(s):

Gareth James, Daniela Witten, Trevor Hastie and Robert Tibshirani. *An Introduction to Statistical Learning with Applications in R* (ISLR). This book is available for free at [http://www-bcf.usc.edu/~gareth/ISL/](http://www-bcf.usc.edu/~gareth/ISL/) : this site also other useful related materials.

Recommended Textbook(s):


Books on Reserve:

Desire2Learn:
This course will make use of the Desire2Learn (D2L) platform. Students who are registered in the course can log on at [http://d2l.ucalgary.ca](http://d2l.ucalgary.ca) through their student centre. Please note that D2L features a class e-mail list that may be used to distribute course-related information. These e-mails go to your University of Calgary e-mail addresses only.
Grade Determination and Final Examination Details:

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<th>Component</th>
<th>Weight</th>
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<tbody>
<tr>
<td>MIDTERM EXAM</td>
<td>30%</td>
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<tr>
<td>FINAL EXAMINATION</td>
<td>40%</td>
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<tr>
<td>PRESENTATIONS (2)</td>
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<td>ASSIGNMENTS (4)</td>
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The official grading system will be used. See [http://www.ucalgary.ca/pubs/calendar/current/f-1-1.html](http://www.ucalgary.ca/pubs/calendar/current/f-1-1.html).

If a student’s letter grade on the final exam exceeds their midterm(s) letter grade, the weight of the midterm(s) is (are) transferred to the final exam. The student must have written the midterm(s) or provided supporting documentation for the absence(s) such as a medical note or statutory declaration.

A passing grade on any particular component of the course is not required for a student to pass the course as a whole.

As per the Writing Across the Curriculum Statement in the Calendar, writing and grading thereof will be a factor in the evaluation of student work.

Any student work which remains undistributed after the last day of classes will be available to students through the instructor's office during the instructor’s office hours.

The final examination will be comprehensive, scheduled by the Registrar, held in a classroom, and last 2 hours. If a student cannot write their final exam on the date assigned by the Registrar's Office, they need to apply for a deferred exam [www.ucalgary.ca/registrar/exams/deferred_final](http://www.ucalgary.ca/registrar/exams/deferred_final). Under no circumstance will this be accommodated by the Department.

Tests and exams will not involve multiple choice questions. Non-programmable calculators WILL be allowed during the writing of tests or final examinations.

The exact date for the in-class midterm will be announced at least one week in advance.

THERE WILL BE NO MAKEUP OR DEFERRED QUIZZES/TESTS/EXAMS under any circumstances, nor may the quizzes/tests/exams be written early. Students unable to write the quizzes/tests/exams because of documented illness, family emergency, religious observance, or university-sanctioned event will have the weight shifted to the final examination; otherwise a grade of zero will be assigned.

Important Dates:

**Midterm Exam: February 13th 2020**

Please check: [http://www.ucalgary.ca/pubs/calendar/current/academic-schedule.html](http://www.ucalgary.ca/pubs/calendar/current/academic-schedule.html)

Reappraisal of Grades and Intellectual Honesty:
For reappraisal of graded term work, see Calendar I.2
[http://www.ucalgary.ca/pubs/calendar/current/i-2.html](http://www.ucalgary.ca/pubs/calendar/current/i-2.html)
For reappraisal of final grade, see Calendar I.3
http://www.ucalgary.ca/pubs/calendar/current/i-3.html

Statement of Intellectual Dishonesty, see Calendar K.4
http://www.ucalgary.ca/pubs/calendar/current/k-4.html

Plagiarism and Other Academic Misconduct, see Calendar K.5
http://www.ucalgary.ca/pubs/calendar/current/k-5.html

Academic Accommodations:
Students seeking an accommodation based on disability or medical concerns should contact Student Accessibility Services. SAS will process the request and issue letters of accommodation to instructors. Students who require an accommodation in relation to their coursework based on a protected ground other than disability should communicate this need in writing to their Instructor. The full policy on Student Accommodations is available at http://www.ucalgary.ca/policies/files/policies/student-accommodation-policy.pdf.

Freedom of Information and Protection of Privacy (FOIP) Act:
Personal information is collected in accordance with FOIP. Assignments can only be returned to the student and will be accessible only to authorized faculty and staff. For more information, see http://www.ucalgary.ca/legalservices/files/legalservices/faq-students.pdf and http://www.ucalgary.ca/legalservices/files/legalservices/faq-faculty_0.pdf.

Internet and Electronic Communication Device information:
The use of cell phones for any purpose in class is prohibited. Computers and tablets may be used for note taking only unless otherwise authorized by the instructor.

Copyright Legislation:
See the University of Calgary policy on Acceptable Use of Material Protected by Copyright at www.ucalgary.ca/policies/files/policies/acceptable-use-of-material-protected-by-copyright.pdf. Students who use material protected by copyright in violation of this policy may be disciplined under the Non-Academic Misconduct Policy.

Recording of Lectures:
Recording of lectures is prohibited, except for audio recordings authorized as an accommodation by SAS or an audio recording for individual private study and only with the written permission of the instructor. Any unauthorized electronic or mechanical recording of lectures, their transcription, copying, or distribution, constitutes academic misconduct. See https://www.ucalgary.ca/pubs/calendar/current/e-6.html.

Important Dates:
Please check: http://www.ucalgary.ca/pubs/calendar/current/academic-schedule.html.

Student Organizations:
Faculty of Arts Students’ Association (F.A.S.A.):
   Economics Department Representative
   Office: SS 803, E-mail: econrep@fasaucalgary.ca and Web: www.fasaucalgary.ca.

Society of Undergraduates in Economics:
   https://www.ucalgarysue.com/.
Society of Undergraduates in Economics is a student run organization whose main purpose is to assist undergraduate economics students to succeed both academically and socially at the University of Calgary. Services include access to the exam bank, career events such as Industry Night and information sessions, mentorship programs, and social events for members. They invite you to join by contacting SUE at societyofundergradsineconomics@gmail.com.

Faculty of Arts Program Advising and Student Information Resources:
- Have a question, but not sure where to start? The Arts Students’ Centre is your information resource for everything in Arts! Drop in at SS102, call them at 403-220-3580, or email them at artsads@ucalgary.ca. You can also visit the Faculty of Arts website at http://arts.ucalgary.ca/undergraduate, which has detailed information on common academic concerns, including program planning and advice.
- For registration (add/drop/swap), paying fees and assistance with your Student Centre, contact Enrolment Services at 403-210-ROCK [7625] or visit them in the MacKimmie Library Block.

Student Support and Resources:
- See https://www.ucalgary.ca/registrar/registration/course-outlines for information on campus mental health resources, the Student Ombuds’ Office, Student Success Centre, Safewalk, and Emergency Evacuation and Assembly.
- Online writing resources are available at https://ucalgary.ca/student-services/student-success/writing-support.