

UNIVERSITY OF WATERLOO
ECONOMICS 421: ECONOMETRIC THEORY
FALL 2017

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Office hours: Fridays, 1:00 p.m. – 2:30 p.m.

Classes: Mondays and Wednesdays, 1:00 p.m. – 2:20 p.m.
PAS 1241
Note: There will be no lecture on Wednesday September 20.

Course description:

This course provides an advanced treatment of topics covered in ECON 322 and 323 using matrix algebra and statistical theory extensively. The course will begin with a review of required matrix algebra and statistical theory. Topics covered will include classical linear models and associated problems, such as multicollinearity, functional form, heteroskedasticity, and autocorrelation. It will also offer an introduction to generalized least squares, instrumental variables, maximum likelihood estimation, and simultaneous equations.

Text:

William H. Greene, *Econometric Analysis* (8th edition), Pearson Education, New York, 2017.

Evaluation:

Final grades will be calculated as follows:

Assignments:	30%
Midterm exam:	30%
Final exam:	40%

A mixture of problem solving and computing assignments will be distributed through the term. The computing assignments may be completed using your preferred statistical software package. Due dates of these assignments will vary according to the amount of work required. Assignments must be handed in at the beginning of the class on their due date. *Late assignments will be assigned a grade of zero, with no exceptions.*

The midterm and final exam will be based on lecture material. The midterm will be held during the regular class time on **October 18** and the final exam will be scheduled by the Registrar's Office. The format of these exams will be discussed in class. Should you be ill and miss the midterm exam and can produce the mandatory *University of Waterloo Verification of Illness Form*

within 48 hours of the missed midterm, the weight will be added to your final exam. Should you miss the final exam, a deferred can be written. Details on requesting a deferred exam, can be found here: <https://uwaterloo.ca/economics/undergraduate/resources-and-policies/deferred-final-exam-policy>. Note that requests for deferred exams must be received within 48 hours of the scheduled exam time.

Course outline:

1. Background Material:

Matrix algebra; Probability and distribution theory; Estimation and inference; Large sample distribution theory (*Appendices A, B, C and D*)

2. The Linear Regression Model:

The linear model; Model assumptions (*Chapter 2*)

3. The Least Squares Estimator:

Least squares regression; Frisch-Waugh Theorem; Finite and large sample properties; Interval estimation; Prediction and forecasting; Data problems (*Chapter 3 and 4*)

4. Hypothesis Testing:

Testing methodology; Size, power, and consistency; Wald tests; Fit based tests; Large sample tests (*Chapter 5*)

5. Functional Form:

Binary variables; Nonlinearities; Structural breaks (*Chapter 6*)

6. Instrumental Variables Estimation:

Extended model; Instrumental variables (IV) estimator; Two-stage least squares (2SLS); Hausman-Wu test; Overidentification test; Weak instruments (*Chapter 8*)

7. The Generalized Regression Model:

Inefficient least squares estimation; Generalized least squares (GLS); Feasible generalized least squares (FGLS); Heteroskedasticity; Weighted least squares (WLS) (*Chapter 9*)

8. Systems of Equations:

Seemingly unrelated regression (SUR); Demand systems; Identification and the order condition; Three-stage least squares (3SLS) (*Chapter 10*)

9. Maximum Likelihood Estimation:

Likelihood functions; Efficient estimation; Information matrix; Cramer-Rao lower bound (*Chapter 14*)

Cross-listed courses: Please note that a cross-listed course will count in all respective averages no matter under which rubric it has been taken. For example, a PHIL/PSCI cross-list will count in a Philosophy major average, even if the course was taken under the Political Science rubric.

Academic Integrity: Academic Integrity: In order to maintain a culture of academic integrity, members of the University of Waterloo are expected to promote honesty, trust, fairness, respect and responsibility. See the UWaterloo Academic Integrity webpage and the Arts Academic Integrity

webpage for more information.

Discipline: A student is expected to know what constitutes academic integrity, to avoid committing academic offences, and to take responsibility for his/her actions. A student who is unsure whether an action constitutes an offence, or who needs help in learning how to avoid offences (e.g., plagiarism, cheating) or about rules for group work/collaboration should seek guidance from the course professor, academic advisor, or the Undergraduate Associate Dean. When misconduct has been found to have occurred, disciplinary penalties will be imposed under Policy 71 Student Discipline. For information on categories of offenses and types of penalties, students should refer to Policy 71 – Student Discipline. For typical penalties check Guidelines for the Assessment of Penalties.

Grievances: A student who believes that a decision affecting some aspect of his/her university life has been unfair or unreasonable may have grounds for initiating a grievance. Read Policy 70 – Student Petitions and Grievances, Section 4. When in doubt, please be certain to contact the departments administrative assistant who will provide further assistance.

Appeals: A decision made or penalty imposed under Policy 70 - Student Petitions and Grievances (other than a petition) or Policy 71 – Student Discipline may be appealed if there is a ground. A student who believes he/she has a ground for an appeal should refer to Policy 72 – Student Appeals.

Accommodation for Students with Disabilities: Note for students with disabilities: The AccessAbility Services office, located on the first floor of the Needles Hall extension (1401), collaborates with all academic departments to arrange appropriate accommodations for students with disabilities without compromising the academic integrity of the curriculum. If you require academic accommodations to lessen the impact of your disability, please register with the AS office at the beginning of each academic term.

Mental Health Support: All of us need a support system. The faculty and staff in Arts encourage students to seek out mental health supports if they are needed.

On Campus:

- Counselling Services: counselling.services@uwaterloo.ca / 519-888-4567 xt 32655
- MATES: one-to-one peer support program offered by Federation of Students (FEDS) and Counselling Services
- Health Services Emergency service: located across the creek from the Student Life Centre

Off campus, 24/7:

- Good2Talk: Free confidential helpline for post-secondary students. Phone: 1-866-925-5454
- Grand River Hospital: Emergency care for mental health crisis. Phone: 519-749-433 ext. 6880
- Here 24/7: Mental Health and Crisis Service Team. Phone: 1-844-437-3247
- OK2BME: set of support services for lesbian, gay, bisexual, transgender or questioning teens in Waterloo. Phone: 519-884-0000 extension 213

Full details can be found online at the Faculty of ARTS website.

Download UWaterloo and regional mental health resources (PDF).

Download the WatSafe app to your phone to quickly access mental health support information.

Territorial Acknowledgement: The Department of Economics acknowledges that we are living and working on the traditional territory of the Attawandaron (also known as Neutral), Anishinaabe and Haudenosaunee peoples. The University of Waterloo is situated on the Haldimand Tract, the land promised to the Six Nations that includes six miles on each side of the Grand River.