Lecture Time & Location: MW, 10:00-11:20pm, AL 105
Tutorial Time & Location: Tuesdays, 8:30-9:20pm, AL 124
Instructor: Thomas Parker
Office: HH 206
Office Hours: Wednesdays, 3pm-4pm
Email/Phone: (email preferred) tmparker@uwaterloo.ca / x38600
Tutorial Instructor: Renfang Tian (r2tian@uwaterloo.ca)

Course Objective:

This introduction to mathematical statistics is intended to develop the basic probabilistic and statistical tools you will need in your later economics courses. You will gain familiarity with three related topics: (*a*) the basics of probability theory, (*b*) random variables and their properties, and (*c*) the application of these areas to statistical inference. Some of your assignments will involve the use of statistical software to find answers. The language used for numerical examples in lectures will be R, which is a standard software package for statistical analysis that is freely available at https://www.r-project.org/. Part of the class will be devoted to the practical aspects of using R to conduct statistical analyses. Some people find the integrated development environment RStudio helpful for things like visualizing data and keeping track of your work (also freely available: https://www.rstudio.com/).

Textbook:

As we go through the course you should read the chapters given in the description of the topics on the next page. Ideally, reading should be done before attending the lectures. The text is:

- Newbold, P., Carlson, W., and Thorne, B., *Statistics for Business and Economics*, Eighth Edition, Pearson 2013.

Detailed description of topics:

Relevant book sections are listed For each topic. It is strongly recommended that you read them before doing your homework.

1. **Probability theory:** (Chapter 3) Basics, combinatorial probability, bivariate probability, conditional probability, independence.

2. **Discrete random variables:** (Sections 4.1-4.4 and Section 4.7) Discrete random variables, expected value and variance, marginal, joint and conditional densities.

3. **Continuous random variables:** (Sections 5.1-5.5) Properties of continuous distributions, the uniform, normal and exponential distributions.

4. **Estimation basics:** (Chapter 6, Sections 7.1-7.5) The sampling distribution of a point estimate, interval estimation.

5. **Hypothesis testing:** (Sections 7.1-7.5, Chapter 9) Hypothesis tests for means, proportions and variances.

6. **Simple regression models:** (Sections 11.1-11.5) Simple linear models, correlation and covariance.

Schedule:

Below is a timeline of topics we will cover and dates of exams. The pace of class will be brisk so it is important to be aware of approaching deadlines.

Week #	Date (Mon.),	Book Chapter(s)	Topics
1	January 1	3	Probability theory
2	January 8	3	Probability theory
3	January 15	3/4	Probability theory, discrete random variables
4	January 22	4	Discrete RVs, expectation and variance
5	January 29	4	Expectation/variance, joint distributions
	January 31		*Midterm 1*
6	February 5	4/notes	Joint distributions, covariance, sums of RVs
7	February 12	5/6/7	continuous RVs, basics of inference
	February 19		*Reading week*
8	February 26	7/9	Inference for means, proportions and variances
9	March 5	7/9	Inference for means, proportions and variances
	March 7		*Midterm 2*
10	March 12	7/9	Inference for means, proportions and variances
11	March 19	11	Linear regression
12	March 26	11	Linear regression
	March 30		*No class*
13	April 2	11	Linear regression

Evaluation:

Your mark will be calculated from of several parts, with weights in parentheses below.

Homework (20%): There will be weekly homework assignments due at the *beginning* of class on Mondays. Your homework should not be a list of answers — showing your work is an important part of doing the assignment (and your grade on the assignment).

Midterm Exams (25% each): There will be two midterm exams. They will be held on January 31 and March 7 and will take place during class. The second midterm will not be cumulative, beyond the fact that the material in the second part of the course depends on the topics covered at the beginning.

Final Exam (30%): The final exam *will* be cumulative, with a focus on the material that was covered after the second midterm exam.

Missed Assignments and Exams:

No homework assignments will be accepted after the due date and time, that is, after the beginning of class. You may turn them in earlier than they are due and you can upload your homework electronically on the Learn site if you cannot bring them to class. There will be a dropbox opened on Learn for online submissions that will become unavailable as soon as class begins on the day the assignment is due.

If you miss a midterm exam, with a valid excuse, the weight of that midterm grade will be added to the weight of the one subsequent test in your final grade calculation.

Other administrative details:

Economics Department Deferred Final Exam Policy

Deferred Final Exam Policy found at https://uwaterloo.ca/economics/undergraduate/resources-and-policies/deferred-final-exam-policy

Cross-listed course

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.

Grievance: 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 department's 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 ext 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 form Student Life Centre

Off campus, 24/7

- Good2Talk: Free confidential help line 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

We acknowledge that we live and work on the traditional territory of the Attawandaron (Neutral), Anishinaabeg and Haudenosaunee peoples. The University of Waterloo is situated on the Haldimand Tract, the land promised to the Six Nations that includes ten kilometers on each side of the Grand River.