University of Waterloo
Department of Economics
ECON 221: Statistics for Economists
Winter 2017

Lecture Time & Location: MWF, 12:30-1:20pm, AL 105
Tutorial Time & Location: Mondays, 1:30-2:20pm, AL 105
Instructor: Thomas Parker
Office: HH 206
Office Hours: Wednesdays, 1:30pm-3pm
Email/Phone: (email preferred) tmparker@uwaterloo.ca / x38600
Tutorial Instructor: Allison Mascella (amascella@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.

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 2	3	Probability theory
2	January 9	3	Probability theory
3	January 16	3/4	Probability theory, discrete random variables
4	January 23	4	Discrete RVs, expectation and variance
5	January 30	4	Expectation/variance, joint distributions
	February 1		*Midterm 1*
6	February 6	4/notes	Joint distributions, covariance, sums of RVs
7	February 13	5/6/7	continuous RVs, basics of inference
	February 20		*Study days (reading week)*
8	February 27	7/9	Inference for means, proportions and variances
	March 1		*Midterm 2*
9	March 6	7/9	Inference for means, proportions and variances
10	March 13	7/9	Inference for means, proportions and variances
11	March 20	11	Linear regression
12	March 27	11	Linear regression
13	April 3	11	Linear regression

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.

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 February 1 and March 1 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 (i.e., after the beginning of class), although you may turn them in earlier than they are due and you can upload your homework electronically on the Learn site (still observing the deadline!) if you cannot bring them to class. 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 (1) subsequent test in your final grade calculation.

Other administrative details:

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 https://uwaterloo.ca/academic-integrity/ and https://uwaterloo.ca/academic-integrity/sites/ca.academic-integrity/files/uploads/files/FinalFact_0.pdf for more information. You are encouraged to discuss homework and course material with other students in class. However, you are responsible for submitting your own work. If I determine that any assignment was not written solely by the student whose name appears on the work, that student will receive a zero for the grade in question and may receive a failing grade for the class.

Discipline: A student is expected to know what constitutes academic integrity to avoid committing an academic offence, 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 instructor, academic advisor, or the undergraduate associate dean.

For information on categories of offences and types of penalties, students should refer to Policy 71, Student Discipline (http://uwaterloo.ca/secretariat/policies-procedures-guidelines/policy-71). For typical penalties check Guidelines for the Assessment of Penalties (http://uwaterloo.ca/secretariat/policies-procedures-guidelines/guidelines/guidelines-assessment-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 (http://uwaterloo.ca/secretariat/policies-procedures-guidelines/policy-70) and the Faculty of Arts' grievance processes information (https://uwaterloo.ca/arts/undergraduate/student-support/academic-standing/student-grievances-faculty-arts-processes). 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 (http://uwaterloo.ca/secretariat/policies-procedures-guidelines/policy-72).

Note for Students with Disabilities: The AccessAbility Services (AS) Office (http://uwaterloo.ca/accessability-services/), located in Needles Hall, Room 1132, 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 AS at the beginning of each academic term.