Statistics for Economists
Economics 103
Spring 2019

Course Instructor: Francis DiTraglia
Office: PCPSE 630
Office Hours: M 3–4pm, R 4–5pm

Recitation Instructors:

	Assa Cohen	Philippe Goulet Coulombe	Gabrielle Vasey
Office:	PCPSE 546	PCPSE 546	PCPSE 528
Office Hours:	TBA	TBA	TBA

Lecture Time and Location: TR 9-10:30AM ANNS 110

Recitations Times and Locations:

Section 201	Section 202	Section 203	Section 204	Section 205	Section 206
Philippe	Assa	Gabrielle	Assa	Gabrielle	Philippe
MCNB 285	WILL 204	MCNB 167-8	WILL 204	MCNB 285	WILL 216
M 10–11am	F 9–10am	M noon–1pm	F 10–11am	M 11am–noon	M 1–2pm

Course Website: `http://ditraglia.com/Econ103Public` At this url you can download all lecture slides, homework problems, etc. You can view your grades and log-on to the course discussion forum, Piazza, at `https://canvas.upenn.edu`.

Email Policy: Please direct all written communication concerning Econ 103 to the course discussion forum – Piazza – rather than to the instructors' personal email accounts. For personal issues, use Piazza's private messaging feature to communicate directly with the course instructors.

Course Description: This course will teach you how to learn from data and understand uncertainty using the ideas of probability theory and statistics. After completing this course you will be able to carry out simple statistical analyses of your own using the computer package R.

Prerequisites: The prerequisites for this course are Math 104 followed by 114 or 115.

Required Text: *Introductory Statistics for Business and Economics*, 4$^{\text{th}}$ Edition by Thomas H. and Ronald J. Wonnacott (WW4). Used copies are available on Amazon for under $20. I will list suggested readings on Piazza every week. While I encourage you to complete the reading assignments, my lecture slides and homework assignments are the final authority on course material.

Required Software: We will use the statistical package R via a front-end called RStudio throughout the course. Both R and RStudio are free and open source. I will post installation instructions on Piazza. RStudio is also available in the Undergraduate Data Analysis Lab (UDAL) in McNeil rooms 104 and 108–9. You will be taught to use R in lecture, recitations, and through as series of tutorials that I will assign as homework. (See "R Tutorials" below.) Additional R resources are listed on the last page of this syllabus. As part of the course, every student will receive a free premium account to DataCamp.

Recommended Texts: I recommend two texts for students who need extra help with the course material. First is the *Student Workbook to accompany Introductory Statistics for Business and Economics 4th Edition*. Used copies are available on Amazon. The workbook contains fully worked out solutions to all odd-numbered problems from the textbook along with additional practice problems and solutions. If you're having trouble with R and prefer a printed book to the free online resources listed below, I suggest consulting *The R Student Companion* by Brian Dennis.

Departmental Course Policies: All Economics Department course policies are in force in Econ 103 even if not explicitly listed on this syllabus. See: `https://economics.sas.upenn.edu/undergraduate/course-information/course-policies` for full details.

Academic Integrity: All suspected violations of the code of academic integrity as set forth in the Pennbook will be reported to the Office of Student Conduct. Confirmed violations will result in a failing grade for the course. We will check identification cards at exams so please to bring yours.

Piazza: We will use an online discussion forum called Piazza, accessible via Canvas, for all written communication in this course. We will use Piazza to make course announcements, answer questions about course material and respond to private messages from individual students regarding personal issues. We will award extra credit for constructive questions, answers, and notes that you post on Piazza, even if you post anonymously. See below under "Extra Credit" for details.

Homework

Homework will consist of three components: review questions, extension problems, and online R tutorials. With the exception of R tutorials, homework will neither be collected nor graded.

Review Questions: Corresponding to each lecture of the semester are 10–15 "review questions" covering the basic knowledge that you will need to acquire this semester to pass the course. These are available from the Course Website. After a given lecture, and before the next one, you should solve all of the associated review questions. To give you an incentive to keep up with the course material, all quiz questions for the course will be randomly selected from this list: see "Quizzes" below. Review questions are straightforward. Most are taken directly from the lecture slides, and nearly all of the rest involve straightforward calculations similar if not identical to those from the lecture. As such we sill not circulate solutions to review questions. Compiling your own solutions is an important part of studying for the course. We will be happy to discuss any of the review questions with you in office hours or on Piazza, and you are most welcome to discuss them with your classmates. Be warned, however, that memorizing answers written by a classmate is a risky strategy. It may get you through the quiz, but will leave you woefully unprepared for exams.

Extension Problems: Unlike review questions, extension problems are designed to give you a deeper understanding of the lecture material and challenge you to apply what you have learned in new settings. Extension problems should only be attempted *after* you have completed the corresponding review problems. As an extra incentive to keep up with the course material, each exam of the semester will contain at least one problem taken *verbatim* from the extension problems. We will circulate solutions to the relevant extension questions the weekend before each exam. Like the review questions, extension problems are available from the Course Website.

R Tutorials: While I will provide numerous R code examples in lecture, you cannot really learn to program by reading a set of slides. As such, I will assign a number of online R tutorials on DataCamp as homework to complement the in-person R instruction that you will receive in recitations. Although these will not be graded, completion of these assignments will count towards your recitation grade: see "Recitations" below. As the semester progresses, R material will appear in extension problems and on midterm and final exams.

Assignments and Grading

Grades for this course will be determined based on recitations, quizzes, two in-class midterms, and a comprehensive final examination that will take place during the exam period. Specifically,

$$\text{Grade} = 10\% \times \text{Recitation} + 20\% \times \text{Quizzes} + 20\% \times \text{Midterm1} + 20\% \times \text{Midterm2} + 30\% \times \text{Final}.$$

You can earn extra credit worth up to 5% of your course grade: see "Extra Credit" for details.

Course Curve: There will be no curve in Econ 103. Grade boundaries will be as follows:

A+	98–100%	B+	88–89%	C+	78–79%	D+	68–69%
A	92–97%	B	82–87%	C	72–77%	D	60–67%
A-	90–91%	B-	80–81%	C-	70–71%	F	0–59%

Quizzes: There will be 11 in-class quizzes over the course of the semester. For dates, see the semester calendar on the last page of this document. Each quiz will cover the two most recent lectures. For example, Quiz #1 will cover lectures 1–2 and Quiz #5 will cover lectures 10–11. When calculating your quiz average, I will drop your two lowest scores and weight the remaining quizzes evenly. There will be no makeup quizzes so be sure to use your two "free skips" carefully. Quizzes will not be returned and answers will not be posted but, your RI will be happy to go over your quiz with you in office hours if you wish.

Exams: There will be two 70-minute in-class midterm exams and a 2-hour final exam during the exam period. Dates appear on the semester calendar on the last page of this document. Each midterm is worth 20% and the final is worth 30% of your grade. Neither midterm is comprehensive, but the final is: it will focus on the final third of the course but include several questions on earlier material. To give you a sense of the style and level of difficulty to expect, I have posted all of my past exams with full solutions on the course website. There will be no makeup midterms: if you miss one midterm, your final exam will be worth 50% to compensate; if you miss two midterms, it will be worth 70%. The makeup final will take place at the beginning of next semester and is outside of the instructor's control: eligibility as well as the time and date are determined by the Economics Department. Cheat sheets are not permitted on exams. Scientific calculators are allowed but graphing calculators are not. You may write in pencil or pen on your exam as it will be photocopied before being returned to you. We will check ID cards at each exam.

Recitations: Attendance at your assigned recitation section is mandatory. Your grade for this component of the course will be determined by your recitation instructor (RI) and will be based on attendance, participation, and successful completion of any R tutorials assigned prior to recitation. (See "R Tutorials.") Consult your RI for his or her specific policy for missed recitations.

Regrade Requests: Exam regrade requests must be made in writing within a week of receiving your graded exam. As we re-grade the entire exam, your score could rise or fall. You may not discuss your answers with an RI or the instructor before submitting a regrade request.

Extra Credit: You can earn extra credit worth up to 5% of your course grade for active participation on the course discussion board, Piazza. Extra credit will be added to your overall course score after averaging all course assignments. For example, if your overall course grade is 83%, your final score after factoring in extra credit will be between 83% and 88%, depending on how much extra credit you earn. Extra credit will be awarded for constructive questions, answers, and notes on Piazza. Even if you post anonymously, we can still award you extra credit for online participation. Extra credit is discretionary and will calculated at the end of the semester. As such, there is no precise formula that we can provide you in advance.

Tuesday	Thursday
Jan 15th **Winter Break – No Lecture**	17th **1** Introduction *No Recitations 1/18 or 1/21*
22nd **2** Summary Statistics I	24th **3** Summary Statistics II **Quiz #1**
29th **4** Regression I	31st **5** Basic Probability I **Quiz #2**
Feb 5th **6** Basic Probability II	7th **7** Basic Probability III / Discrete RVs I **Quiz #3**
12th **8** Discrete RVs II	14th **9** Discrete RVs III **Quiz #4**
19th **Midterm I** – Material through Feb. 14th	21st **10** Discrete RVs IV
26th **11** Continuous RVs I	28th **12** Continuous RVs II **Quiz #5**
Mar 5th **Spring Break – No Lecture**	7th **Spring Break – No Lecture**
12th **13** Sampling Dists. & Estimation I	14th **14** Sampling Dists. & Estimation II **Quiz #6**
19th **15** Confidence Intervals I	21st **16** Confidence Intervals II **Quiz #7**
26th **17** Confidence Intervals III	28th **18** Hypothesis Testing I **Quiz #8**
Apr 2nd **Midterm II** – Material through March 28th	4th **19** Hypothesis Testing II
9th **20** Hypothesis Testing III	11th **21** Hypothesis Testing IV **Quiz #9**
16th **22** Statistical Power	18th **23** Regression II **Quiz #10**
23rd **24** Regression III	25th **25** Reserve Lecture **Quiz #11**
30th **26** Reserve Lecture	May 2nd **Reading Day – No Lecture**