

**UNIVERSITY OF PENNSYLVANIA  
SCHOOL OF ARTS AND SCIENCES  
DEPARTMENT OF ECONOMICS**

**Econ 103 - Statistics for Economists\*  
Fall 2017**

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Office Hours: Friday: 11-1

**Objectives and Prerequisites (from Economics Course Register)**

**ECON 103. Statistics for Economists.** Prerequisite(s): MATH 104 and MATH 114 or MATH 115 and ECON 001 and ECON 002 or ECON 010. Intended primarily for economics majors. ECON 103 cannot be taken by any student who has already completed Statistics at least at the level of STAT 430 (including the sequence STAT 430/431). Such students must take an additional 200-level course to satisfy course requirements of the major. The course focuses on elementary probability and inferential statistical techniques. The course begins with a survey of basic descriptive statistics and data sources and then covers elementary probability theory, sampling, estimation, hypothesis testing, correlation, and regression. The course focuses on practical issues involved in the substantive interpretation of economic data using the techniques of statistical inference. For this reason, empirical case studies that apply the techniques to real-life data are stressed and discussed throughout the course, and students are required to perform several statistical analyses of their own.

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\* The material obtained in this class is not to be shared with those outside of the class.

**Time and Location of Lectures and Recitations:****Lectures:**

Tuesday: 12 -1:30, ANNS 110

Thursday: 12 -1:30, ANNS 110

**Recitations:**

201 - Friday: 9 -10, MCNB 169

202 - Monday: 10 -11, WILL 202

203 - Friday: 10 -11, MCNB 169

204 - Monday: 9 -10, WILL 202

**Textbook and Other References** (Penn Bookstore has copies of the books, which are also on Rosengarten Reserve. New and used copies are also available at Amazon):

**Required textbook: Wonnacott, T.H. & R.J. Wonnacott, *Introductory Statistics for Business and Economics (4th edition)*. John Wiley. 1990.**

**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. Installation instructions appear on the last page of this syllabus. 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 a series of tutorials and assignments. After completing this course you will be able to carry out simple statistical analyses of your own using the computer package R.

**Recommended:**

**Wonnacott, T.H. & R.J. Wonnacott, *Student Workbook to accompany Introductory Statistics for Business and Economics (fourth edition) and Introductory Statistics (fifth edition)*. John Wiley. 1990.**

**Newbold, P., W. Carlson and B. Thorne, *Statistics for business and economics* (8<sup>th</sup> ed.), Pearson, 2013.**

**Dennis, B., *The R Student Companion*, Taylor & Francis Group, 2013.**

**Econ 103 course website created by Professor DiTraglia:**  
<http://ditraglia.com/Econ103Public>.

**Data sources:**[www.census.gov](http://www.census.gov), [www.bls.gov](http://www.bls.gov), [www.bea.doc.gov](http://www.bea.doc.gov), [www.federalreserve.gov](http://www.federalreserve.gov),  
[www.stls.frb.org](http://www.stls.frb.org), [www.phil.frb.org](http://www.phil.frb.org), [www.cbo.gov](http://www.cbo.gov), [www.treasury.gov](http://www.treasury.gov), [www.nber.org](http://www.nber.org),

[www.conferenceboard.org](http://www.conferenceboard.org), <http://data.worldbank.org/>, [www.imf.org](http://www.imf.org), [www.data.oecd.org](http://www.data.oecd.org),  
<http://data.un.org>

**Course Outline (other readings will be given during the semester)**

1. Descriptive Statistics and Data Analysis (Lectures #1, #2)  
Wonnacott&Wonnacott, Chps. 1, 2, 15.1,11-1,11-2,22.1
2. Probability (Lectures #3, #4)  
Wonnacott&Wonnacott, Chp. 3
3. Random Variables and Probability Distributions (Lectures #5, #6, #7, #8)  
Wonnacott&Wonnacott, Chp. 4, 5
4. Sampling (lectures #9, #10)  
Wonnacott&Wonnacott, Chp.6
5. Estimation (Lectures #11, #12, #13, #14)  
Wonnacott&Wonnacott, Chp. 7, 8
6. Hypothesis Testing (Lectures #15, #16, #17, #18, #19, #20)  
Wonnacott&Wonnacott, Chp. 9
7. Regression (Lectures #21--)  
Wonnacott&Wonnacott, Chp. 11, 12, 13, 14.3, 14.4, 15.2, 15.4

While I strongly encourage you to complete the reading assignments and suggested problems, lectures are the final authority on course material.

**Suggested Problems from the textbook:**

1-1,1-3,1-5,1-7,1-9,1-11, 1-13, 1-17  
2-1,2-3,2-5,2-7,2-13,2-15,2-17  
3-1,3-3,3-5,3-9,3-11,3-13,3-15,3-17,3-19,3-21,3-23,3-25,3-27,3-29  
4-1,4-3,4-5,4-7,4-9,4-11,4-13,4-15,4-19,4-21,4-23, 4-25,4-27,4-29  
5-1,5-3,5-5,5-9,5-11,5-13,5-17  
6-1,6-3,6-5,6-7,6-15,6-17,6-19,6-21  
7-1, 7-3, 7-5, 7-9,7-13, 7-17, 7-19  
8-1, 8-3, 8-5, 8-7, 8-9,8-17,8-19,8-21  
9-23, 9-27, 9-29  
11-1,11-3  
12-3, 12-5, 12-11  
13-5, 13-13, 13-27  
14-1, 14-3, 14-5  
15-1, 15-5

**Suggested Problems from the course web-site:**

There are many homework assignments and solutions posted on the course website: <http://ditraglia.com/Econ103Public>.

Although homework will neither be collected nor graded, it is crucial that you keep up with the homework on a weekly basis if you hope to learn the material and do well in the course. Be sure to use the solution keys responsibly: you gain nothing by simply reading through the answers.

**Departmental Course Policies:** All Economics Department course policies are in force in Econ 103 even if not explicitly listed on this syllabus. See Departmental Policies for Undergraduate Economics Courses <https://economics.sas.upenn.edu/undergraduate-program/course-information/guidelines/policies>

**Academic Integrity:** All suspected violations of the code of academic integrity as set forth in the Pennbook (<https://provost.upenn.edu/policies/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. <http://www.upenn.edu/academicintegrity/>

**Attendance:** Attendance is required and crucial in learning the material and doing well in the course.

**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.

**Piazza:** We will be using 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. By asking your question and getting an answer on Piazza, you create a positive externality: other students benefit from your questions and you benefit from theirs. You can even post anonymously if asking questions publicly makes you uncomfortable. The instructor and RIs will actively moderate Piazza both to answer questions and approve (or correct) answers written by your fellow-students. 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. As mentioned above under “Email Policy,” all written communication for Econ 103 should be directed to Piazza, not to the instructors’ personal email accounts.

**Prerequisites:** The prerequisites for this course are Math 104 followed by 114 or 115. To help you determine if this course is right for you we will administer a short math quiz early in the semester. Although it will not count towards your grade, you must pass this quiz to be

allowed to take the first midterm. You may re-take the math quiz as many times as necessary until you pass.

### **Grading**

Grades for this course will be determined based on quizzes administered in recitation, two in-class midterms, and a comprehensive final examination:

**Overall Score** =  $(30\% \times \text{Quizzes}) + (20\% \times \text{Midterm 1}) + (20\% \times \text{Midterm 2}) + (30\% \times \text{Final})$

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

**Course Curve:** If necessary, I will curve overall course scores (not individual assignments) so that approximately 30% fall in the A-range, 40-50% fall in the B-range, and the bulk of the remaining 20-30% fall in the C-range. I reserve grades below a C-minus for those cases in which a student fails to attain a minimum level of basic competence in statistics, an absolute rather than relative standard. If you are in danger of failing to meet this minimum standard, you will receive a course problem notice. I will only curve the course in your favor, so the most stringent possible grade boundaries are: A-range = 90-100, B-range = 80-89, C-range = 70-79, D-range = 60-69. (In this case, the top two points of each range would be a “plus” and the bottom two points a “minus.”)

**Quizzes:** Your RIs will administer a number of short quizzes in recitation over the course of the semester: dates appear on the semester calendar on the course website. Each quiz will cover basic material from the most recent lectures since the last quiz or midterm. When calculating your quiz average, I will drop your two lowest scores and weight the remaining quizzes evenly. There will be no make-up quizzes, so use your two “free skips” carefully. It is probably best to be prepared to take all the quizzes. Quizzes will not be returned and answers will not be posted but your RI will go over each quiz in recitation. You are also welcome to view your quiz at your RI’s office hours.

**Exams:** There will be two 70-minute in-class midterm exams and a 2-hour final exam during the exam period. 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, all exams with full solutions from the recent past are posted on the course website: <http://ditraglia.com/Econ103Public>. 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. All exams are closed books and notes. 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.

Dates and times of Exams:

Exam 1 (September 28<sup>th</sup>, Thursday, 12-1:30, CHEM 102) (20 %)

Exam 2 (November 9<sup>th</sup>, Thursday, 12-1:30, CHEM 102) (20%)

Final Exam (to be scheduled by the Registrar, Friday, December 15<sup>th</sup>, 12-2, tentative.

Please, re-check the Registrar's site on last day of classes) (30%)

See final exam rules: <http://provost.upenn.edu/policies/pennbook/2013/02/13/rules-governing-final-examinations>

**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 in-class and online participation. Participation will be added to your overall course score after averaging all course assignments. For example, if your overall weighted average on exams and quizzes 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, as well as for attendance and participation in in-class polls and activities. Even if you post anonymously on Piazza, we can still award you extra credit for online participation. Extra credit is discretionary and will be calculated at the end of the semester by the course instructor in consultation with your RI. As such, there is no precise formula that we can provide you in advance. Extra credit is intended as a modest additional reward for students who are taking the course seriously, regardless of whether they struggle or excel on quizzes and exams. Attempts to game the system are not worth the effort: use your time to study instead.

### **Installing R and RStudio**

First, download and install R from <http://cran.r-project.org/>. Second, download and install RStudio by visiting <http://rstudio.org/download/desktop> and clicking the link listed under "Recommended for Your System." If you have trouble, ask your RI or the instructor for help in office hours. Here are links to some additional free resources to help you learn R:

- <http://cran.r-project.org/other-docs.html>
- <http://www.twotorials.com/>
- <http://www.r-bloggers.com/google-developers-r-programming-video-lectures/>
- <http://cran.r-project.org/doc/contrib/Farnsworth-EconometricsInR.pdf>,  
<https://cran.r-project.org/doc/manuals/R-intro.pdf>