

## **Syllabus**

### **Economics 482**

University of Washington

Winter 2018

MW 5:30-7:20 pm TBD

Instructor: Gregory M. Duncan

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Office: Savery 341

Office Hours: MW 4-5:30PM

TA: Stephanie Liu

Lab W 7:30-8:20 pm TBD

### **COURSE CONTENT**

- Introduction to the analysis of economic data at the undergraduate level; covers the basic methods of econometrics, and some new machine learning methods.
  - Techniques that will help you to use and interpret economic data and models.
  - Practice in the use of computers for economic data analysis.
  - Skills developed are useful in further work in any social science field: either graduate work or employment as a data analyst or researcher .
- This course assumes a good background in statistics and mathematics. Calculus will be used without discussion.
- My goal is making you employable at consulting firms, government agencies and some firms that use analytics heavily (or would like to.) This course will also prepare you for graduate work.

### **REQUIREMENTS**

- 6 problem sets, graded on a simple scale, these must be submitted online.
  - (good, satisfactory, unsatisfactory, no credit) (4,3,1,0) (15%)
  - involve real economic problems and real data, to be done on a PC/ Mac using R, Python and EXCEL.
- One midterm (25% )
- A final (60%).
- Optional sections are once a week. Computer analysis will be handled there.

### **TEXT(s)**

- **Introductory Econometrics: A Modern Approach 6<sup>th</sup> Ed.** (Jeffrey Wooldridge) (There are really few differences after the second edition except for homework problems.)
- **Using R for Introductory Econometrics** (Florian Heiss) free, online version <http://www.urfie.net/>
- Supplementary reading **Computer Age Statistical Inference: Algorithms, Evidence, and Data Science** (Bradley Efron & Trevor Hastie) free online version [https://web.stanford.edu/~hastie/CASI\\_files/PDF/casi.pdf](https://web.stanford.edu/~hastie/CASI_files/PDF/casi.pdf)

This latter is the book I will use in 484, if you are going to take that course, read the regression parts of this book as well, though the perspective is very different and the books are complements, not substitutes

## PREREQUISITES

- some economics
  - Economics 300 and some macro
- some calculus and math
  - Integral and Differential Calculus Math 124 would be fine
  - Basic exposure to matrices (I assume most of you saw matrices in high school). I will not do matrix derivations, but for notational sanity and to allow you to read empirical papers they are essential.
  - You can, in principle, determine when you can solve and, if appropriate, then solve  $n$  linear equations in  $n$  unknowns.
- statistics
  - Basic understanding of probability distributions
  - Basic understanding of testing

**Readings and Content:** I'll add or delete as I go along. At a minimum we will cover Chapters 1-10 plus Appendices A-E from Wooldridge (W). Additionally, I will add some machine learning material on model selection: L2-boosting, False Discovery Rate Control, and the LASSO.

### ***Before first class***

Chapter 1, Appendices A,B,C  
Chapter 19 (for the first time)

First Section: Quiz in Section on Basics (graded as a homework, very, very simple, but if you do poorly you don't have the background for the course and should drop it).

Appendix D (Matrices; done in Section)

Chapter 2 The Simple Regression Model  
Chapter 3 Multiple Regression Analysis: Estimation  
Appendix E The Linear Regression Model in Matrix Form  
Chapter 4 Multiple Regression Analysis: Inference  
Chapter 5 Multiple Regression Analysis: OLS Asymptotics  
Chapter 6 Multiple Regression Analysis: Further Issues  
Notes on Model Selection: The Lasso and l2-boosting  
Chapter 19 (for the second time)  
Exam on Regression

Chapter 7 Multiple Regression Analysis with Qualitative Information: Binary (or Dummy) Variables  
Chapter 8 Heteroskedasticity  
Chapter 10 More on Specification and Data Issues  
Chapter 19 (for the third time)  
Chapter 13 Basic Regression Analysis with Time Series Data  
Chapter 15 Instrumental Variables Estimation and Two Stage Least Squares  
Chapter 16 Simultaneous Equations Models

Final: Comprehensive

**Software:** We will be teaching R and using EXCEL.

For R you'll probably want the IDE R-Studio

<https://www.rstudio.com/products/rstudio/download/>

(there are Windows, Mac, Ubuntu and Fedora/Red Hat versions). For EXCEL you can get free versions of Office as a UW student.

Also useful is to see what Federal Judges expect from econometric work presented in courts. Here is an URL to the **Reference Manual on Scientific Evidence**. Federal judges use these manuals (one is for multivariate regression, another for basic statistics).

[http://www.fjc.gov/public/pdf.nsf/lookup/sciman00.pdf/\\$file/sciman00.pdf](http://www.fjc.gov/public/pdf.nsf/lookup/sciman00.pdf/$file/sciman00.pdf)