UC Berkeley - Political Science Math Camp
Fall 2017 syllabus

August 7th - 18th, 2017

Instructor: Guadalupe Tuñón
Office Hours: by appointment
guadalupe.tunon@berkeley.edu
Sections and Grading: Christopher Carter
christopher.carter@berkeley.edu

This course presents key mathematical concepts and ideas students need to know before beginning their study of the formal and quantitative tools used in political science research. Topics covered include probability and statistics, vectors, matrices, single-variable and multi-variable calculus, and optimization. This is a lot to cover in two weeks, so we will selectively focus on specific mathematical concepts that are most commonly used in applied formal and quantitative research. The goal of this two week course is to provide a foundation that helps students to succeed in subsequent methods courses.

There will be six problem sets assigned throughout the course. The problem sets are required. They are an integral part of the course–you will probably learn very little if you dont work through the problems. You can work on the problem sets in groups but you should always try to work out all the answers yourself before meeting with your group. Each student needs to hand in his/her copy of the solutions. We will also hold a two-hour discussion section twice a week (see below for the full schedule). During this time, we will review the homeworks and work through exercises. Section attendance is optional. There will be a final exam at the end of the course. Many people find the material really comes together for them in the process of studying for the exam. Taking the exam will give you a real appraisal of how much youve learned and what your strengths and weaknesses are.

We will not be covering computational skills in this course. If you are planning on doing empirical work or are planning to take PS 231A in the fall, you will be expected to learn `R`. The learning curve for computational skills can be a bit steep in the beginning, so if you have no experience with `R` you should consider working on it during the summer and/or taking an intensive workshop at the D-lab.[1] They offer a two intensive courses right before the semester starts, so watch out for them checking the D-lab's website: http://dlab.berkeley.edu/.

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[1]We will send you a separate document listing sources that may be helpful to learn `R` on your own this summer.

Full class Schedule:

Monday 7th: Lecture 9am-12pm (791 Barrows Hall).
Tuesday 8th: Lecture 9am-12pm (791 Barrows Hall) and section 2pm-4pm (791 Barrows Hall).
Wednesday 9th: Lecture 9am-12pm (791 Barrows Hall).
Thursday 10th: Lecture 9am-12pm (791 Barrows Hall) and section 2pm-4pm (791 Barrows Hall).
Friday 11th: NO CLASS
Monday 14th: Lecture 9am-12pm (791 Barrows Hall) and section 2pm-4pm (791 Barrows Hall).
Tuesday 15th: Lecture 9am-12pm (791 Barrows Hall).
Wednesday 16th: Lecture 9am-12pm (791 Barrows Hall) and section 2pm-4pm (791 Barrows Hall).
Thursday 17th: NO CLASS
Friday 18th: Final exam 9am-12pm (791 Barrows Hall).

Course Readings:

We will use the following required texts for the course:

1. David Freedman, Robert Pisani, and Roger Purves, *Statistics* (New York: Norton, 1980).

2. David Freedman, *Statistical Models: Theory and Practice* (New York: Cambridge University Press, 2009).

3. Jeff Gill, *Essential Mathematics for Political and Social Research* (Cambridge: Cambridge University Press, 2006).

4. Carl P. Simon and Lawrence Blume, *Mathematics for Economists* (New York: Norton, 1994).

Readings schedule:

1. **PROBABILITY AND RANDOM SAMPLES.**

   - FPP Ch 13-14; 16-17.
   - FPP Ch 4-5; 8; 18; 20-21.

2. **LINEAR ALGEBRA, VECTORS AND MATRICES.**

   - Gill Ch 3-4.
   - Freedman (2009) Ch 3.
   - Simon and Blume pages 199-213; 153-159; 165-172; 188-193; 213-220.

3. **SINGLE-VARIABLE CALCULUS.**

   - Gill Ch 5.
   - Simon and Blume pages 39-57.

4. **MULTI-VARIABLE CALCULUS.**

   - Gill Ch 6.
   - Simon and Blume pages 396-397, 411-434.

How to Prepare for Math Camp during the Summer

Methods in grad school is very much a self-taught endeavor. Not only does everyone start with a different background but also different interests, which may require specific tools. Learning to teach yourself new material will be key to your success in the coming years.

Although the math camp seeks to prepare you to use the methods you will need for your research, two weeks is a really short time. The more you can prep for it, the more useful it will be. In this handout, I will direct you to some material that can help you get ready for math camp and your first year more broadly.[2]

Probability & Statistics

A great reading to do over the summer to cover these topics is the Freedman, Pisani, and Purves book. It is one of the best ways to get familiar with the concepts and make sure you understand the fundamentals of what is going on.

Online courses: Konrad Menzel. 14.30 Introduction to Statistical Methods in Economics, Spring 2009. (Massachusetts Institute of Technology: MIT OpenCourseWare). The full course is useful. Unfortunately.

Jeremy Orloff, and Jonathan Bloom. 18.05 Introduction to Probability and Statistics, Spring 2014. (Massachusetts Institute of Technology: MIT OpenCourseWare). Just the first section (probability).

Matrices & Derivatives

Online course: David Jerison. 18.01SC Single Variable Calculus, Fall 2010. (Massachusetts Institute of Technology: MIT OpenCourseWare). You can check out the first section of the course (sessions 1-12).

Online course: Denis Auroux. 18.02 Multivariable Calculus, Fall 2007. (Massachusetts Institute of Technology: MIT OpenCourseWare). Good to covers linear algebra and derivative in the same course. Lectures 1-3, 8, 11-14.

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[2]This list of resources is always work in progress so if you identify other sources that you think should be listed here, please email me about it so that I incorporate it to future iterations of this guide.