Coursework Appendix to

Thinking of Pursuing a PhD in Economics? Info on Graduate School and Beyond

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Economics PhD Coursework

Economics research requires a comprehensive understanding of various mathematical and statistical concepts. Additionally, researchers often leverage computer programming skills to analyze and process data. Thus, to prepare yourself to be an economics researcher, it is important to take classes in math, statistics, and computer programming. Moreover, graduate schools will consider applicants' math and statistics backgrounds in the admissions process.

Below is a list of classes that can prepare you well for a PhD program, categorized by level. Although some fields of economics are less mathematically demanding than others, it is important to develop a solid foundation of mathematical and statistical knowledge for success in your PhD coursework because economic theory tends to include a lot of proofs and calculus.

Within the profession, there are varying opinions on how central mathematical expertise is to economics research. It is certain, though, that in order to make meaningful contributions to society as an economics researcher, you need to be mathematically competent, but you do not need to be a math genius. The classes below may seem daunting, but give them a try! Don't worry if you don't ace every single class on this list—just try as many as possible to make yourself a stronger candidate for PhD programs.

Basic Courses are essential and are also useful preparation for any research assistant (RA) position:
- **Introductory and Intermediate Micro and Macroeconomics**
- **Introductory Econometrics** - This class will likely cover OLS regressions, differences in differences, instrumental variables, and interaction variables. The book *Mastering Metrics* can provide you with an intuitive understanding.
- **Calculus 1–3** - If your school does not use this terminology for calculus classes, just make sure you have taken multivariate differential and integral calculus courses.
- **Introductory Statistics**

Expected Courses are ideally completed by the end of your undergraduate (or master's) degree and are generally expected by top PhD programs:
- **Linear Algebra** - Taking this class early on will make statistics, econometrics, coding, and higher-level economics classes easier. It is often a prerequisite. It will teach you the basics (and more!) of matrices.
- **Intermediate Statistics** - These classes will make you a better econometrician. You can look for classes that are requirements for statistics majors to get a better idea of what to take. Generally, more theoretical, proof-based classes are useful.

- **Independent Research** - This could be done as a thesis seminar in which your sole assignment is to write your own research paper, preferably with guidance from a professor. The paper should use econometric techniques similar to or more advanced than the ones covered in your econometrics course. Other paper-based classes that allow you to do your own research may be comparable.
- **Economics Electives** - These classes will give you an idea of what can be done in the field of economics. To this end, the topics and quantity of these classes are up to your discretion.
- **Real Analysis** - This is a high-level proof-based math class. Many people find it to be quite challenging, and many graduate schools place a lot of value on students having taken it. However, it is not technically a prerequisite to most programs, and other similarly difficult math classes may also suffice.
- **A couple other medium to high-level math and/or statistics classes** - These are to sharpen your math and statistics skills, prepare you for higher-level economics courses, and show graduate schools you are good at math. Some popular choices are Ordinary Differential Equations, optimization-related classes, as well as classes that may be required of math and statistics majors. It is generally wise to choose theoretical instead of applied courses because they require a deeper understanding of the material.

Advanced Courses can make you a more competitive applicant and give you a taste of graduate school:
- **Advanced/Graduate Level Econometrics, Microeconomics, or Macroeconomics -** These classes will be highly theoretical and mathematical. At many universities, this might only be available as the first class in a Ph.D. sequence.
- **High-level Math classes -** These would be more difficult than Real Analysis. Some good examples are measure theory and functional analysis.
- **High-level Statistics classes**

Computer Science Courses can also be quite useful in equipping yourself to conduct research or work as a research assistant. STATA and R are popular choices for economists, and Python and MATLAB are also commonly used. The most useful computer science courses would focus on handling data.

Letters of Recommendation
Letters of recommendation are a crucial part of the admissions process. You may want to get several letters, and together they should reflect your capabilities as an economics student, as well as a researcher. It is a good idea to include at least one letter from a professor who taught a class in which you performed well. It is also best to include at least one letter from a Ph.D. economist with whom you have worked on research, such as a thesis advisor, or an economist for whom you were an RA. It may be the case that your letter writers cover research experience, academic experience, or both. Regardless, graduate schools generally ask for two to three letters, and you may want to keep this in mind when building relationships with professors and researchers.

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