

AGEC 651: Econometrics II  
Department of Agricultural Economics  
Purdue University  
Spring 2017

**Course Details:**

Professor: Michael S. Delgado  
Class Schedule: MWF 1:30-2:20 Rawls 1071  
Office: KRAN 635  
Office Hours: Walk-in or by appointment  
Email: delgado2@purdue.edu

**Course Description:**

This course covers basic PhD level econometrics and introduces new methods at the frontier of applied econometrics, emphasizing theoretical foundations and application of techniques. We will develop the linear regression model, the properties of the least squares estimator, hypothesis testing, endogeneity and instrumental variables regression, and generalized linear regression. We will introduce alternative estimation techniques such as maximum likelihood, generalized method of moments, nonlinear regression, and methods for panel data. The final part of the course will cover identification and estimation of causal treatment effects, including both reduced form and structural approaches.

**Textbook and Materials:**

*Econometric Analysis*, 7th Edition, Greene (required for Parts 1-3)

Imbens, G. W. and Wooldridge, J. M., 2009. "Recent Developments in the Econometrics of Program Evaluation," *Journal of Economic Literature*, 47:1, 5-86 (required for Part 4)

Athey, S. and Imbens, G. W., 2016. "The State of Applied Econometrics – Causality and Policy Evaluation", working paper (required for Part 4)

**Software:**

All homework assignments and the semester project are to be done using R. No exceptions.

**Grading Policy:**

The grade for this course will be based on homework assignments, quizzes, a midterm exam, a semester project, and a final exam. The semester project is to be submitted on or before the last day of class. Semester grades will be determined according to the following weights:

Homework: 10%  
Quizzes: 15%  
Midterm: 25%  
Project: 20%  
Final Exam: 30%

**Homework Assignments:**

The homework assignments focus on application of the models developed in the lectures. Students will manually program the data and estimation in R, and will submit R code along with the solution for each assignment. Students are encouraged to work together on homework assignments, but must submit individual copies of each assignment. Late homeworks will not be accepted unless there is a university approved absence.

**Quizzes:**

Quizzes will be periodically given during class and need not be announced ahead of time. Quizzes are closed book, and students are required to work independently. Missed quizzes cannot be made up. In the case of a university approved absence, the missed quiz will be omitted from the semester grade calculation.

**Exams:**

Both midterm and final exam will be in-class, written examinations. Make-up exams will not be given unless there is a documented university approved absence. In all possible cases, the instructor must be notified in advance for a make-up to be given.

**Project:**

By the end of the course, students will complete a Monte Carlo simulation analysis of a particular econometric estimator. The purpose of this project is for students to get comfortable motivating, deriving, and manually programming advanced econometric techniques.

The topic of the projects will be determined near the start of the semester. The submitted project must include a brief motivation for the estimator, a thorough description/derivation of the econometric model and estimation approach, and a complete Monte Carlo simulation that illustrates the performance of the estimator. Written projects not to exceed 10 pages in length; references are not part of the page count. All R code used for estimation is to be carefully annotated and included with final submission (not part of page count). Grades for the project will be given based on the appropriateness of the motivation given, the rigor and clarity of the derivation, the quality of the Monte Carlo analysis, and the overall quality of the writeup.

Students are strongly encouraged to work throughout the entire semester on the project, and to consult frequently with the instructor.

**Course Outline:**

1. The Basic Linear Regression Model
  - Linear Regression
  - Least Squares Estimator
  - Properties of Least Squares Estimator
  - Hypothesis Testing
2. Extensions of the Linear Regression Model
  - Functional Form and Structural Change
  - Endogeneity and Instrumental Variable Regression
  - Generalized Linear Regression
3. Introduction to Alternative Estimation Methods
  - Maximum Likelihood Estimation
  - Generalized Method of Moments Estimation
  - Nonlinear Estimation
  - Systems of Equations Estimation
4. Identification and Causal Analysis
  - Potential Outcomes and Causal Effects
  - The Importance of Sample Selection, Balance, and Overlap
  - Estimation when Selection is on Observables

- Estimation when Selection is on Unobservables
- Causal Spatial/Social Spillovers

Note: Topic list is tentative and subject to change based on pace of the course. Readings for Parts 1-3 will come from Greene's *Econometric Analysis*, and Part 4 will come from Imbens and Wooldridge (2009), Athey and Imbens (2016), and my own notes.

### **Communication:**

My primary method of communication will be through email to your Purdue email address, so it is your responsibility to check your Purdue email on a regular basis.

### **Campus Emergencies:**

In the unusual event of a major campus emergency, course requirements, deadlines and grading percentages are subject to changes that may be necessitated by a revised semester calendar or other circumstances. To get information about changes in this course visit the course home page, contact me by email or call me at my office. To report an emergency, call 911. To obtain updates regarding an ongoing emergency, sign up for Purdue Alert text messages, view [www.purdue.edu/ea](http://www.purdue.edu/ea). There are nearly 300 Emergency Telephones outdoors across campus and in parking garages that connect directly to the PUPD. If you feel threatened or need help, push the button and you will be connected immediately. If we hear a fire alarm during class we will immediately suspend class, evacuate the building, and proceed outdoors. Do not use the elevator. If we are notified during class of a Shelter in Place requirement for a tornado warning, we will suspend class and shelter in the basement. If we are notified during class of a Shelter in Place requirement for a hazardous materials release, or a civil disturbance, including a shooting or other use of weapons, we will suspend class and shelter in the classroom, shutting the door and turning off the lights. Please review the Emergency Preparedness website for additional information: <http://www.purdue.edu/ehps/emergency-preparedness/index.html>.

### **Academic Dishonesty:**

University policy on academic dishonesty is clear: academic dishonesty in any form is strictly prohibited. Anyone found to be cheating or helping someone else cheat will be referred directly to the Dean of Students for disciplinary action. Academic dishonesty includes citing someone else's work as your own, using cheat sheets, or sharing your answers with someone else. If you are unsure whether your planned action constitutes academic dishonesty, seek clarification from the instructor. Details of the Purdue University academic integrity policies can be found here: [http://www.purdue.edu/purdue/about/integrity\\_statement.html](http://www.purdue.edu/purdue/about/integrity_statement.html). Writing assignments for this course will be checked for originality using the iThenticate software.

### **Special Needs:**

If you have a disability that requires academic adjustments, please make an appointment to meet with me during the first week of classes to discuss your needs. Please note that university policy requires all students with disabilities to be registered with the Disability Resource Center in Young Hall (765-494-1247) before classroom accommodations can be provided. Accommodations will be made based on documentation from the Purdue University Disability Resource Center.

## My Philosophy Regarding this Course:

You have chosen to undertake the challenges of a PhD. This is a core course in our PhD curriculum, and the tools you will develop in this course are *fundamental* to your development as a professional economist. This course will provide you with the tools you need to go on to take more advanced econometrics courses, and to develop the foundations of your prospectus/dissertation. The course is designed to be both comprehensive and challenging. *I leave it up to you to seek help if you need it, tell me what challenges you, and stay on top of the material on at least a week-to-week basis.*

To be generally successful, I recommend that you

- spend several hours between each lecture reviewing class material;
- read the relevant sections of the textbook;
- ask questions in class;
- come to my office and ask me questions.

To be get the most out of the homework assignments, I recommend working in groups to

- discuss the econometric model, assumptions, and interpretation of parameters;
- make sure that you understand how to program the models.

To be successful on the semester project, I recommend that you

- do not attempt to complete the entire assignment in the last week of the semester;
- consult with me frequently.