

# Agricultural Economics 652

## Application of Quantitative Analysis: Mathematical Programming

### Syllabus Spring 2018

**Instructor:**

Paul Preckel

Office and Phone: 589 Krannert, 494-4240

E-mail: [preckel@purdue.edu](mailto:preckel@purdue.edu)

**Prerequisites:**

Agricultural Economics 552. As a substitute for 552, a thorough understanding of matrix algebra, differential calculus, and linear programming is a good substitute. If you have not had 552 or at least one course covering each of these topics, see the instructor to discuss your background and possible supplementary material.

**Objectives:**

The focus of the course will be on the theory and practical aspects of mathematical programming and on the formulation of mathematical models with a primary focus on optimization models. Topics will include: a review of optimality conditions and convex analysis for nonlinear programming and a variety of approaches to modeling. The modeling section of the course will include models of the consumer, the producer, and the sector. Model features such as risk, dynamics, and approaches to incorporating government policies and private contractual arrangements will also be addressed. Non-parametric efficiency testing will be included. The course will involve a good deal of hands-on model formulation and construction. The tool for numerical model solution will be the GAMS modeling language, the features of which will be addressed during the course.

**Lectures:**

Lectures will be delivered during regular class sessions. Expect to read the notes (see below), ideally keeping a bit ahead of the lecture. It is good to plan that we will get through about 30 slides per class. In addition, there will be a computer lab help session. The help session will be arranged so as to accommodate as many of your schedules as possible – to that end, we will take a poll a week or so into the semester to find a day/time that works for as many as possible.

**Book:**

An extensive (but not expensive!) set of notes will be available from the Xerox Copy Shop in the Purdue Memorial Union. These notes bear a copyright notification and are not to be posted on line, and may not be exchanged without my written consent. Reference Book – Brooke, A., D. Kendrick, and A. Meeraus, GAMS: User's Guide and GAMS Solver Manuals, Release 2.25, GAMS Development Corporation, Washington, D.C., 1996. (This reference material, along with

a variety of other useful documents relevant to the GAMS language, is on the World Wide Web at <http://www.gams.com/docs/document.htm>. These materials are also available for the most part through the GAMS help facility.)

### **Exams and Grades:**

Grades will be based on performance on a two-part midterm examination (30%), a final examination (35%), homework and quizzes (30%) and class participation (5%). The tentative date for the first part of the midterm is the Thursday immediately before Spring Break during the regular class period. The tentative date for the second part of the midterm, which is a hands-on demonstration of your GAMS skills, is during the week immediately after Spring Break during the computer help session time-slot. The final will be scheduled by the University during finals week, will be two hours long and comprehensive. Exams are closed book and closed notes. You may bring one 8 1/2" x 11" sheet of paper on which you may write or print whatever you want. You are encouraged to bring a calculator.

### **Homework Policy:**

To be considered "on time," homework papers must be submitted by the time the instructor begins grading them. This will occur no earlier than 5:00 pm on the day that the papers are due, and may occur somewhat later. Check with the instructor for the grading schedule if you will be handing in a paper late. *Papers that are turned in late, but are turned in before corrected papers and solutions have been distributed, will receive a 10% penalty. Papers turned in after corrected papers and solutions have been distributed will be marked, but no credit will be given.*

Homework comprises a substantial portion of the grade for this course. Some of the homework will be difficult. Because the instructor believes that you learn a lot by working together and that figuring things out together does a good job of simulating the way you will operate in your research career, you are encouraged to discuss homework and strategy for solution. *However, you are required to write up the homework (including the programs) independently.* Violations of this rule will be dealt with harshly (see Academic Misconduct section below).

### **Computer Usage:**

Mathematical programming (not necessarily numerical) is pervasive in applied economics. It is used: as the basis for neoclassical economics, to simulate the implications of environmental change, to evaluate agents' responses to policies and contracts, to *derive* econometric problems to be estimated, to *estimate* econometric problems, and to develop operational plans for a wide variety of businesses. For some purposes, these models have neat, closed-form solutions. One goal of this course is to help you understand when closed form solutions will exist, and when they will be tractable. However, many models are impractical, or even impossible to solve analytically and hence must be approached numerically. Numerical solution is often a stumbling block for the applied economist. One of the goals of this course is to remove this stumbling block. Hence, the computer will be one of the primary tools of analysis for this course.

Each student will have to learn to use the GAMS programming language (access is available on the Department's computer network). You may also download the student version of GAMS from the Web at <http://www.gams.com/download/>. Use of GAMS will be *required* for the

homework. Students should be familiar with the MS-Windows operating system. Operating system topics will not be addressed in the course.

### **Special Needs:**

Purdue University is required to respond to the needs of the students with disabilities as outlined in both the Rehabilitation Act of 1973 and the Americans with Disabilities Act of 1990 through the provision of auxiliary aids and services that allow a student with a disability to fully access and participate in the programs, services, and activities at Purdue University.

If you have a disability that requires academic adjustments, please make an appointment with me during the first two (2) weeks of class to discuss your needs. It is important that we talk about this at the beginning of the semester. It is the student's responsibility to notify the Disability Resource Center (<http://www.purdue.edu/drc>) of an impairment/condition that may require accommodations and/or classroom modifications.

### **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. Information about ongoing on-campus emergencies will be posted at <http://www.purdue.edu>. Local news is available at <http://www.wlfi.com> and <http://www.jconline.com>. Cell phone emergency text messages will be sent to those signed up for them. You can register for this university service at <http://www.purdue.edu/securepurdue/>. For specific information regarding changes in this course, visit the course home page, contact me by email at [preckel@purdue.edu](mailto:preckel@purdue.edu), or call my office (494-4240).

### **Communication:**

Please note that my primary out-of-class method of communication will be via email to your Purdue email address. I will not generally attempt to contact you at email addresses other than your Purdue email address. It is your responsibility to check for mail on a regular basis. I recommend checking your Purdue email at least once every 24 hours.

### **Academic Integrity:**

Purdue prohibits "dishonesty in connection with any University activity. Cheating, plagiarism, or knowingly furnishing false information to the University are examples of dishonesty." [Part 5, Section III-B-2-a, University Regulations] Furthermore, the University Senate has stipulated that "the commitment of acts of cheating, lying, and deceit in any of their diverse forms (such as the use of substitutes for taking examinations, the use of illegal cribs, plagiarism, and copying during examinations) is dishonest and must not be tolerated. Moreover, knowingly to aid and abet, directly or indirectly, other parties in committing dishonest acts is in itself dishonest." [University Senate Document 72-18, December 15, 1972]

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. Penalties are severe and may include dismissal from the University. The risks associated with cheating far outweigh the perceived benefits.

Academic dishonesty includes citing someone else's work as your own, using unapproved "cheat sheets" or sharing your answers with someone else. If you are unsure whether an action you are considering constitutes academic dishonesty, seek clarification from your instructor. Other information regarding your rights and responsibilities as a student are contained in the university's [code of conduct](#).

**Honor Pledge:**

*“As a boilermaker pursuing academic excellence, I pledge to be honest and true in all that I do. Accountable together - we are Purdue.”*

**Nondiscrimination:**

Purdue University is committed to maintaining a community which recognizes and values the inherent worth and dignity of every person; fosters tolerance, sensitivity, understanding, and mutual respect among its members; and encourages each individual to strive to reach his or her own potential. In pursuit of its goal of academic excellence, the University seeks to develop and nurture diversity. The University believes that diversity among its many members strengthens the institution, stimulates creativity, promotes the exchange of ideas, and enriches campus life.

Purdue University prohibits discrimination against any member of the University community on the basis of race, religion, color, sex, age, national origin or ancestry, marital status, parental status, sexual orientation, disability, or status as a veteran. The University will conduct its programs, services and activities consistent with applicable federal, state and local laws, regulations and orders and in conformance with the procedures and limitations as set forth in ([http://www.purdue.edu/purdue/ea\\_eou\\_statement.html](http://www.purdue.edu/purdue/ea_eou_statement.html)) which provides specific contractual rights and remedies.

**Anti-Harassment Policy:**

Purdue University is committed to maintaining an environment that recognizes the inherent worth and dignity of every person; fosters tolerance, sensitivity, understanding and mutual respect; and encourages its members to strive to reach their potential. The most effective way to work toward preventing Harassment is through education that emphasizes respect for every individual.

Harassment in the workplace or the educational environment is unacceptable conduct and will not be tolerated. Purdue University is committed to maintaining an educational and work climate for faculty, staff and students that is positive and free from all forms of Harassment. This policy addresses Harassment in all forms, including Harassment toward individuals with legally protected status for reasons of race, gender, religion, color, age, national origin or ancestry, genetic information or disability and Harassment toward individuals for other reasons such as sexual orientation, gender identity, gender expression, marital status or parental status. The University will not tolerate Harassment of its faculty, staff or students by persons conducting business with or visiting the University, even though they are not directly affiliated with the University. Anti-Harassment Policy (III.C.1): <http://www.purdue.edu/policies/ethics/iic1.html>

**This syllabus is subject to change.**