Course Syllabus

Dale T. Manning
B304 Clark
970-491-5706 (office)
Dale.manning@colostate.edu
OH: Tuesday and Thursday, 3-4pm, and by appointment
Final Exam: Thursday, 12/19/2019, 6:20-8:20 pm (if it’s take-home, due by 6:20 pm 12/19)
Midterm Exam: 10/29/2019 in class

TA: Salvador Lurbe
Salvador.lurbe@colostate.edu
OH: Wednesday 10:30-11:30am, and by appointment, Clark B302

Course Description

This course is for graduate students interested in applied economics. I assume you have some background in economic theory. Content will provide an overview of optimization methods used in economics, with an emphasis on numerical techniques such as coding basics, linear and nonlinear programming, and dynamic optimization. We will become familiar with these numerical techniques while emphasizing appropriate interpretation of results. Generally, examples used in class will be relevant to students interested in environmental, resource, and agricultural economics, though methods are more widely applicable.

Course Objective

This course has 3 overall objectives. First, you should become familiar with numerical optimization methods available for solving economic problems. This includes setting up, solving, and interpreting model output. Next, you should become comfortable using a computer software. I will use the program R in class, but you are free to use your preferred program (e.g., Matlab, Python, GAMS). Finally, students should be able to develop a mathematical programming model of behavior in a range of applied settings. Students will write a paper that develops and solves a programming model in a context of their choosing. Even if a dissertation/thesis does not contain a programming model, the work in this class should inform the development of hypothesis tests and interpretation of reduced form econometric modeling.
Prerequisites

According to the DARE website, AREC 506 (Applied Micro Theory) is the prerequisite for this class. In practice, this means that I assume you have seen the basics of producer, consumer, and general equilibrium theory and have solved constrained and unconstrained optimization problems. I do not, however, assume that you have developed an optimization model on your own or used numerical methods to solve these problems.

Textbooks

I will use one book for linear programming methods but will draw from several when discussing other numerical methods such as nonlinear programming and dynamic optimization. I may also ask you to read other articles but will make those available on Canvas. Finally, each of you will choose an article to present to the class.

The linear programming book is *Applied Mathematical Programming Using Algebraic Systems*. It is self-published by Bruce McCarl and Thomas Spreen and is available online at [http://agecon2.tamu.edu/people/faculty/mccarl-bruce/books.htm](http://agecon2.tamu.edu/people/faculty/mccarl-bruce/books.htm).

Other textbooks I will use include:


Grading

Grades will come from a mid-term (15%), a final (20%), a paper review and presentation (10%), about 6 homework assignments (25%), a modeling paper* (25%), and participation (5%). The mid-term and final will be take-home exams. I will hand out a homework assignment about every 2-3 weeks and specify a due date (you will have approximately 2 weeks per homework). You can collaborate on homework and turn in one problem set per 2 people but exams must be done entirely independently. I encourage you to come to office hours if additional help is needed. Homework answer keys will be available for most problem sets and should help in preparing for the mid-term and final.

I will give grades based on a percentage score but use a curve to ensure that the average grade is approximately a B+.

*More details to follow but this assignment will likely have several parts, including a proposal, and final draft.
If you are a student who will need accommodations in this class due to a disability or chronic health condition, please make an appointment with me to discuss your individual needs. Any accommodation must be discussed in a timely manner prior to implementation. A verifying accommodation letter from Resources for Disabled Students is required before any accommodation is provided. Student Disability Center [https://disabilitycenter.colostate.edu/] located in TILT, room 121 or via phone 970-491-6385.

Main Course Topics (VERY Tentative)

1. Modeling basics/intro
   a. Uses
   b. Problem setup and components
   c. R intro
2. Linear programming
   a. Solution methods
   b. Interpretation
   c. Duality
3. Nonlinear programming
   a. Solution methods
   b. Computable general equilibrium (CGE) models
4. Dynamic optimization
   a. Intro to dynamics
   b. Dynamic programming
   c. Optimal control
5. Other
   a. Stochasticity/Risk
   b. Rootfinding
   c. Function approximation
   d. Integer programming
   e. Numerical integration/differentiation
   f. Positive mathematical programming
6. Student presentations
   a. Paper review
   b. Research project
Principles of Community

The Principles of Community support the Colorado State University mission and vision of access, research, teaching, service and engagement. A collaborative, and vibrant community is a foundation for learning, critical inquiry, and discovery. Therefore, each member of the CSU community has a responsibility to uphold these principles when engaging with one another and acting on behalf of the University.

Inclusion:

We create and nurture inclusive environments and welcome, value and affirm all members of our community, including their various identities, skills, ideas, talents, and contributions.

Integrity:

We are accountable for our actions and will act ethically and honestly in all our interactions.

Respect:

We honor the inherent dignity of all people within an environment where we are committed to freedom of expression, critical discourse, and the advancement of knowledge.

Service:

We are responsible, individually and collectively, to give of our time, talents, and resources to promote the well-being of each other and the development of our local, regional, and global communities.

Social Justice:

We have the right to be treated and the responsibility to treat others with fairness and equity, the duty to challenge prejudice, and to uphold the laws, policies and procedures that promote justice in all respects.
**Mental Health statement**

Need Help?

CSU is a community that cares for you. If you are struggling with drugs or alcohol and/or experiencing depression, anxiety, overwhelming stress or thoughts of hurting yourself or others please know there is help available. Counseling Services has trained professionals who can help. Contact 970.491.6053 or go to [http://health.colostate.edu](http://health.colostate.edu). If you are concerned about a friend or peer, tell someone at by calling 970.491.1350 to discuss your concerns with a professional who can discreetly connect the distressed individual with the proper resources ([http://supportandsafety.colostate.edu/tellsomeone](http://supportandsafety.colostate.edu/tellsomeone)). Rams take care of Rams. Reach out and ask for help if you or someone you know is having a difficult time.

**Sexual Assault and Violence Elimination**

CSU’s Student Sexual Harassment and Violence policy, following national guidance from the Office of Civil Rights, requires that professors follow CSU policy as a “mandatory reporter” of any personal disclosure of sexual harassment, abuse, and/or violence related experiences or incidents shared with the professor in person, via email, and/or in classroom papers or homework exercises. These disclosures include but are not limited to reports of personal relational abuse, relational/domestic violence, and stalking. While professors are often able to help students locate appropriate channels of assistance on campus (e.g., see the CSU Health Network link below), disclosure by the student to the professor requires that the professor inform appropriate CSU channels to help ensure that the student’s safety and welfare is being addressed, even if the student requests that the disclosure not be shared.

For counseling support and assistance, please see The CSU HEALTH NETWORK, which includes a variety of counseling services that can be accessed at: [http://www.health.colostate.edu/](http://www.health.colostate.edu/). And, The Sexual Assault Victim Assistance Team is a confidential resource for students that does not have a reporting requirement and that can be of great help to students who have experienced sexual assault. The web address is [http://www.wgac.colostate.edu/need-help-support](http://www.wgac.colostate.edu/need-help-support).