Agricultural Economics 642  
Dynamic Optimization in Agricultural and Applied Economics  
3 Credits  
Spring 2021

Instructor  
Richard Woodward  
210M AGLS Building  
Office: 979-845-5864  
Home: 979-703-6470  
r-woodward@tamu.edu

Office Hours and communication  
- Open door policy  
- e-mail messages usually receive prompt response.  
- If necessary, you may call me at home, but please not after 9:00.

I. Course Description  
Economics of problems of dynamic optimization, focusing on numerical and analytical methods. Applications in a wide range of issues related to agricultural and applied economics are considered.

II. Learning Outcomes  
- Develop an intuitive understanding of dynamic economic problems including (discrete and continuous, deterministic and stochastic).  
- Apply dynamic economic analysis in the areas of agricultural and natural resource economics.  
- Analyze papers in which dynamic optimization plays a central role.  
- Set up and solve dynamic optimization problems, both analytically and numerically, and to understand the strengths and weaknesses of alternative methods.

III. Textbook and resource material  
There is no required textbook; see the section on texts below. Most class material will be distributed via the class homepage is located at http://agecon2.tamu.edu/people/faculty/woodward-richard/. Notes, problem sets and other information relevant to the course will be available there. I will provide notes for each lecture on the web site at least 48 hours prior to each class. If notes are not posted by this time, contact me because it is likely that there has been a computer glitch. If for some reason I fail to post the notes at that time, I will supply printed copies in class.

IV. Prerequisites  
It will be assumed that you have a very strong understanding of calculus (constrained optimization and integration), linear algebra and fundamental principles of probability and statistics. You must also be comfortable with the basic microeconomic results of consumer and producer theory. Previous exposure to differential equations would be helpful, but is not assumed. These prerequisites are satisfied by ECON 629 or approval of instructor.

V. Attendance  
Attendance is expected at every class. Students who are not able to attend a class should consult with the professor to ensure that they obtain all the material covered during class. See Student Rule 7 for more information on attendance and excused absences: http://student-rules.tamu.edu/rule07
VI. Grading

The grading system to be used in this course will probably be different from any other course that you have taken. Your grade will depend on the extent to which you demonstrate mastery of a range of skills and concepts. The list of skills and concepts will be circulated and is available from the class home page. These skills and concepts fall into three groups, I. General Issues in Dynamic Optimization, II. Optimal Control, and III. Numerical Dynamic Programming, and three levels: Basic (A), Intermediate (B) and Advanced (C). Mastery tests over concepts in these categories should take around 15, 30, or 60 minutes respectively.

Mastery of a basic concept will be demonstrated by correctly answers 100% of a set of multiple choice questions on that topic. After one attempt, a student may be retested on that concept after a delay of at least 2 days. Retakes may be administered through an oral or short answer questions at the discretion of the instructor.

Mastery of an intermediate concept will be demonstrated by correctly answering short answer questions. Students will be allowed only one attempt to demonstrate mastery on an intermediate concept after the last day of class.

Mastery of an advanced concept will be demonstrated by solving problems or through a discussion with the instructor. Students will be allowed only one attempt to demonstrate mastery of an advanced concept after the last day of class.

Mastery Tests (MTs) are self-scheduled in coordination with the instructor. They must be scheduled by e-mail at least 24 hours in advance. MTs will be graded within 2 weekdays. A student who fails an MT must wait at least 2 days after receiving their grade before they are allowed to retake another MT over that concept.

For a D a student must attend at least 50% of the classes, submitting questions on reading and participating in classroom exercises.

For a C a student must complete the requirements for a D plus demonstrate mastery of 100% of the basic concepts (level A) in all groups.

For a B a student must complete the requirements for a C plus demonstrate mastery all intermediate topics in Group I, plus at least 75%* of the intermediate concepts (level B) in both Groups II and III.

For an A a student must complete the requirements for a B plus demonstrate mastery of at least 90%* all intermediate concepts in Groups II and III, at least 75%* of the advanced topics (level C) in either Group II or Group III, and all advanced topics in Group I.

Students who demonstrate mastery of at least 75%* of the advanced topics in both Groups II and III will also receive a letter indicating their exceptional accomplishment, which will be sent to the Graduate Office for inclusion in the student’s permanent file.

* A percentage goal $P$ is satisfied by passing $n$ of $N$ MTs in a category if $100 \cdot \frac{(n+1)}{N} > P$ (note the strict inequality, so this does not apply to thresholds of 100%).

It is a violation of the honor code to reveal the contents of any of the Mastery Tests.

VII. Calendar

All Mastery Tests (MTs) are self-scheduled, but must be completed before the date of the officially scheduled final examination. Extensions may be requested, but retakes of MTs are restricted as indicated above.
VIII. Homework Assignments
There will be three homework assignments that are intended to give you an opportunity to practice your skills, but these will not be graded. Their completion is, however, a prerequisite for taking many of the MTs. If a homework problem is a prerequisite, evidence of having completed the problem must be submitted prior to scheduling that MT. A student may request the answer key at any time, but this must be done after showing his or her work to the instructor. Since homework assignments are not graded, clarity and legibility is less important than is typically the case.

IX. Team-based Learning
During the course we will use team-based learning in which class time is spent primarily working on problems with members of a team with whom you will work all semester. There will be no standard lectures. Instead, you will be required to read and study the notes for each class prior to arriving each day and then we will engage the material and take it to a higher level in class.

Classroom exercises and “Readiness Assessment Tests” will be used throughout the semester to give you practice with important concepts and prepare you for the mastery tests.

For most classes, students must submit 1-3 questions on the lecture notes to be covered that day.

Teammates will carry out two peer evaluations of each other during the semester. The peer evaluations will not affect a student’s grade, but are a required class element.

In the event that there is insufficient preparation for classes and/or participation in team-based activities, the grading rubric outlined above will be adjusted to provide stronger incentives.

X. Computer Programming
The use of computers is central to much of applied economic analysis and will play a major role in this course. The only way to learn a foreign language is by practicing. The same rule holds for programming languages. Courses should be seen as an opportunity to learn a new language. The more languages you “speak,” the more flexibility that you have as you try to solve a problem. On the other hand, learning a language can be time consuming and get in the way of learning the economic concepts that are the focus of the course. So you must balance the associated benefits and the opportunity costs based on your own interests, time constraints and talents.

There will be optional computer labs during which students can obtain assistance in the use of programming languages that will be used to complete the homework assignments.

All of the computer homework assignments can, at least in theory, be completed using many languages including Fortran, Gauss, R, GAMS, Matlab, Python or Visual Basic. Some of the problems could even be solved in Excel or other spreadsheets. You may use almost any program language to complete the assignments for this course. The default language for the numerical dynamic programming part of this course will be Visual Basic and specific instruction for that language will be provided. VB is used because it is readily accessible (if you have Excel, you have VB), its syntax is quite easy to learn, it integrates easily with the graphing and analytical capabilities of Excel, and it provides a nice stepping stone to other languages. There are a number of books that will help you learn to program, including the book by Albright noted below.

You are encouraged to use a language other than VB; you will probably learn more. If you want to use an alternative language, please discuss it with me to make sure that it will work.

XI. Texts
The following are optional texts and should be available for purchase or download online. I would not recommend buying all of these books as the cost would be excessive and there is some repetition. You are welcome to look at my copies of these books before making a decision and copies of some books are available for loan. For the nuts and bolts of numerical dynamic programming, excellent
available references are the chapter by Rust (*Handbook of Computational Economics*), the text by Miranda and Fackler, and a few chapters of the book by Judd. If you have not done a lot of programming, then the Albright or Miranda and Fackler texts might be helpful, depending on whether you intend to do the programming assignments in VB or Matlab.

**Optimal Control**


**Dynamic Programming & Numerical Methods**


**VB Programming**


XII. Acknowledgments

In developing the material for this course I draw on numerous sources, and I want to give the authors credit. As a general disclaimer, unless stated explicitly, I claim the discovery of none of the material covered in the course, only its presentation. If you are unsure of the source for the material that I am presenting, simply ask and I will normally be able to provide the necessary citation, at least after the problem set has been handed in. Unpublished sources that I will draw on include:

Karp, Larry. Lecture notes on Methods of Dynamic Analysis and Control. University of California, Berkeley


XIII. Academic Integrity Statement and Policy

“An Aggie does not lie, cheat or steal, or tolerate those who do.” For clarification on what this means in practice, see http://aggiehonor.tamu.edu

XIV. Americans with Disabilities Act (ADA) Policy Statement

Texas A&M University is committed to providing equitable access to learning opportunities for all students. If you experience barriers to your education due to a disability or think you may have a disability, please contact Disability Resources in the Student Services Building or at (979) 845-1637 or visit http://disability.tamu.edu. Disabilities may include, but are not limited to attentional, learning, mental health, sensory, physical, or chronic health conditions. All students are encouraged to discuss their disability related needs with Disability Resources and their instructors as soon as possible.