Agricultural Economics 642
Dynamic Optimization in Agricultural and Applied Economics
3 Credits
Spring 2017

Instructor
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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: A. basic, B. intermediate and C. advanced.

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 3 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.

All Mastery Tests (MTs) are self-scheduled, but must be scheduled at least 24 hours in advance. Unless permission is granted, no more than 4 MTs may be taken per day. MTs will be graded within 2 weekdays. A student who fails an MT must wait at least 2 weekdays before retaking the MT over that concept. Holiday periods and weekends do not count.

For a D a student must attend at least 50% of the classes, submitting questions and participating in TBL exercises; and must complete the peer evaluation(s).

For a C a student must complete the D requirements and demonstrate mastery of all basic concepts in all groups.

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

For an A a student must complete the B requirements and demonstrate mastery of at least 90%* all intermediate concepts in Groups II and III, at least 75%* of the advanced topics 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 included in the student’s permanent file.

* A percentage goal P＜100% is satisfied by passing n of N MTs in a category if 100 \( \left( \frac{n+1}{N} \right) > P \) (note the strict inequality).

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.

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. A student may request the answer key at any time, but this must be done after showing his or her work to the instructor.

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 days students must submit 1-3 questions on the lecture notes to be covered during a class period.

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. I believe that you should look at each course you take 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.

We will have optional computer labs during which students I will be available to assist 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 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.

*However,* I encourage you 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 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**
Economics*. New York: Cambridge University Press. [Very well written introduction to
optimal control]

[A very good reference for optimal control]

**Dynamic Programming & Numerical Methods**
Adda, Jerome and Russell W. Cooper. 2003. Dynamic Economics: Quantitative Methods and

Hall.

Cambridge, Mass.: MIT Press. [excellent applied text. The authors use Matlab to solve a wide
range of problems]

excellent overview of methods with strong theoretical foundations - a useful reference book]

**VB Programming**
Excel*. Pacifica Grove, CA: Duxbury. [A nice reference for those who will do their
programming using visual basic]

**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, I claim the discovery of *none* of the material covered in the course. 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

Provencher, Bill. Lecture notes on Dynamic Resource Economics. University of Wisconsin –
Madison.

**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**
The Americans with Disabilities Act (ADA) is a federal anti-discrimination statute that provides comprehensive
civil rights protection for persons with disabilities. Among other things, this legislation requires that all students
with disabilities, be guaranteed a learning environment that provides for reasonable accommodation of their
disabilities.

If you believe you have a disability requiring an accommodation, please contact the Department of Disability
Services in Room B118 of the Cain Hall Building or call 845-1637. For additional information, visit
http://disability.tamu.edu