L Karp

Course Outline
ARE 263, Fall 2006
Methods of Dynamic Analysis and Control

I am going to wait to see who is enrolled in this class before finalizing the syllabus. You should treat this document as a provisional syllabus. It will at least give you an idea of what this course is about.

Course requirements: Approximately (i) half a dozen problem sets (ii) a “paper” and (iii) a final exam. The paper consists of formulation and analysis (not necessarily complete) of a dynamic optimization problem chosen by the student.

Books:

A) Dynamic Optimization, 2nd ed, M Kamien and N Schwartz, North Holland

B) Elements of Dynamic Optimization, Alpha Chaing, McGraw Hill.

C) Dynamic Programming and Optimal Control, D Bertsekas, Athena Scientific Press (1995)

D) Mathematical Bioeconomics, C Clark 2nd ed, Wiley

E) Natural Resource Economics, Notes and Problems, Jon Conrad and Colin Clark, Cambridge University Press

F) Elementary Differential Equations and Boundary Value Problems, W Boyce and R DiPrima, John Wiley and Sons (or some other ODE book)

G) Differential Equations, Stability and Chaos, W Brock and A Malliaris, North Holland, 1989

H) Decision and Control in Uncertain Resource Systems, M Mangel, Academic Press, 1985.

I) Numerical Methods in Economics, Kenneth Judd, MIT Press 1999

J) Applied Computational Economics and Finance, M Miranda and P Fackler,MIT Press, 2002

Articles and Notes (List is incomplete)

Brander, James and Scott Taylor "The Simple Economics of Easter Island: a Ricardo-Malthus Model of Renewable Resource Use". AER 1998, vol 88 pp 119 - 138.

Caputo. Chapter 16 of unpublished Lecture Notes on Dynamics

Clarke and Reed. "Consumption/Pollution Tradeoffs..." Journal of Economic Dynamics and Control 1994 vol 18 pp 991 - 1011.

Feichtinger et al, "Limit Cycles in intertemporal adjustment models" JEDC 1994 vol 18 pp 353 - 380.

Karp. 10 sets of lecture notes

Krugman, P. (1991) "History versus Expecation" QJE 651 - 67.

LaFrance J and L Barney (1991) "The Envelope Theorem in Dynamic Optimization" J of Econ Dynamics and Control 15: 355-385.

Tahvonen and Salo. "Nonconvexities in Optimal Pollution Accumulation", Journal of Environmental Economics and Management (1996) vol 31 pp 160 - 177.

Xie, D (1997) "On Time Inconsistency..." JET vol 76 pp 412 - 430.

The following is a provisional list of topics. I intend to change it by moving some of the material in section 5 to earlier in the course, and by spending more time on applications, including: (i) prices versus quantities in a dynamic setting, (ii) anticipated learning, (iii) hyperbolic discounting, and (iv) coordination problems in a dynamic setting.

Provisional list of topics (with some readings)

1. Basics of Ordinary Differential Equations (ODEs) and Phase Plane Analysis. D, chapter 6; A, appendix B; F, chapter 9; Karp #1; Krugman, P. (1991) "History versus Expecation" QJE 651 - 67.

2. The Calculus of Variations (COV). A, part I, sections 1 - 11; or B, chapters 1 - 4. Karp #2.

3. The Maximum Principle. A, part II, sections 1 - 9; or B, chapters 7 - 9; Dynamic Envelope Theorem. Caputo; or A, part II section 8; LaFrance and Barney. Karp #3.

4) Uncertainty. A, pp 61 - 63 and 190 - 193; Clarke and Reed; Karp #4.

5) Dynamic Programming, discrete and continuous time. J, Chapters 6 – 9. A, part II, section 21; C (vol 1), chapter 1 and 3; Karp #5. (Applications to “Prices versus Quantities”)

6) Two stochastic control problems. H, pp 50 - 53. C, chapter 6.1 - 6.3; Karp and Pope; Karp #6.

7) Limit Cycles and adjustment cost problems. Two State Variables and Cycles. Feichtinger et al.; Karp #7.

8) Nonconvexities. G pp 159 - 168; Tahvonen and Salo; Karp #8.

9) Linear control problems, deterministic and stochastic. A, part I, section 13 and part II, section 13; D, chapter 2.7; Karp #9; Weitzman's fish paper.

10) Dynamic Games. Karp #10, Xie.

11) Learning.

12) Hyperbolic discounting

13) Estimating dynamic models