ECON 406:

Economic Dynamics A

COURSE OUTLINE 2005 (tentative)

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Prerequisites: 48 ECON/QUAN/MOFI/OPRE/MATH 300-level credits among which OPRE 358 and OPRE 359 are recommended; ECON 305 and/or ECON 314 would be additionally advantageous.

Timetable: Thursday **1030 - 1220** in RH G01.

Lecturer: Jacek B Krawczyk, RH 325, X 5352.

*For the standard information on the **Statute of Conduct, grievances**, etc, see our notice board.*

AIMS

To teach economic applications of discrete-time deterministic and stochastic optimal control.

OBJECTIVES

Students passing this course should be able to model and solve basic dynamic optimisation problems.

CONTENT

One agent economic problems will be presented as optimal deterministic and stochastic control theory problems. The relevant theory will be developed and applied to various situations in micro and macroeconomics.

Markov decision processes will be used for modelling and solution of a few typical economic problems. Solutions to linear-quadratic problems will be provided. Infinite horizon optimisation problems will be discussed.

WORKLOAD, ASSESSMENT AND TERMS REQUIREMENTS

- As a guideline, students are expected to spend 8 hours a week on this course including class contact time. This may however vary considerably for individual students.
- Any student with particular requirement should advise the lecturer, so as to ensure that appropriate arrangements can be made. This applies particularly to students with disabilities.
- Plagiarism is not acceptable in any form in Faculty of Commerce & Administration courses, and work will be penalised in line with the seriousness of the case. For further information see our notice board.
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Assessment: final test: 70 %; in-term work: 30%. The latter is split as follows: two assignments: 12%, 13%, activity bonus - 5%.

TOPICS COVERED

("1 unit" *is a weekly session of 100 minutes.*)

1. Description of Dynamic Systems (1 unit)
   Discrete or continuous time models? Difference equations. State space models.

2. Optimal Control (1 unit)
   Control models; features. Constraints. Optimisation models. Dynamic programming.

3. Dynamic Programming *cont.* (1 unit)
   An analytical solution. Infinite horizon. Optimal allocation between consumption and investment. Time consistency of optimal solutions.

4. A Simple Steady State *vs.* a Turnpike Steady State. (1 unit)
   Steady State Solutions. Turnpike conditions in continuous time. Implicit programming problem. Maximum principle.

5. Deterministic Linear-Quadratic Models (2 units)
   The centred case. The Riccati equation. The uncentred case.

6. Markov decision processes (2 units)
   Markov chains. Computational issues: approximations; value iteration, policy improvement.

7. Linear-Quadratic-Gaussian Models (2 units)
   Certainty equivalence. Separation principle. Kalman filter.

8. Some Economic Applications (2 units)
   A portfolio management problem; an inventory problem.

ASSIGNMENT DUE DATES

1. **Week 8**
2. **Week 11**

TEXTBOOKS

various; e.g.:

J. B. Krawczyk
Optimal Control for Economics. 2005 ECON 406 Lecture Notes.
Handouts will be placed on Blackboard

D. Bertsekas
Dynamic Programming and Stochastic Control

P. Whittle
Optimal Control: Basics and Beyond. Closed Reserve

P. Whittle
Optimization over Time (stollen from VUW Library)

D.A. Carlson, A.B. Haurie & A. Leizarowitz
Infinite Horizon Optimal Control