

# Mathematics III: Part II

Alexandre N. Kohlhas

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**Summary:** This part of the course studies techniques for deriving optimizing behavior in dynamic circumstances. A variety of methods – *Lagrange’s Method*, *Optimal Control* and *Dynamic Programming* – are described and illustrated. Necessary and sufficient conditions are discussed.

**Recommended Textbook:** *Further Mathematics for Economic Analysis*, Sydsaeter, Hammond, Seierstad and Strom, Prentice Hall, Second edition.

**Alternative Textbooks:** “Optimal Control Theory with Economic Applications” by Seierstad and Sydsaeter (1987); “Introduction to Modern Economic Growth” by Acemoglu (2008); “Lectures on Macroeconomics” by Blanchard and Fisher (1989).

## Lecture Outline:

1. Wed Dec 6: 10:00 - 12:00, E319

Introduction, Lagrange’s Method, Optimal Control Theory, Pontryagin’s Principle.

2. Thu Dec 7: 10:00 - 12:00, F299

Optimal Control Theory cont’d, Mangasarian, Bang-bang controls, Mixed Constraints

3. Fri Dec 8: 10:00 - 12:00, E387

Dynamic Programming, Contraction Mapping Theorem, Blackwell’s Sufficient Conditions

4. Mon Dec 18: 10:00 - 12:00, B413

Dynamic Programming cont’d, Theorems with Stochastics, Algorithms and Examples

5. Tue Dec 19: 10:00 - 12:00, B413

Continuous Time Dynamic Programming, Connection with Optimal Control Theory