COURSE CONTENT

Course Coordinator	Chris Sakellariou
Course Code	HE3601 / HE3004
Course Title	Mathematical Economics / Mathematics for Economists II
Pre-requisites	(a) HE2003 Econometrics I (applicable to ECON, ECDS, DD, DM) and (b) HE2001 Microeconomics II/HE9092 Economic Theory/HE5092 Economic Theory
No of AUs	3
Contact Hours	39 hours (Lecture of 2 hours and 1 hour of tutorial per week)

Course Aims

Introductory and intermediate economics courses (Microeconomics and Macroeconomics) heavily use intuition and graphs to analyze economic issues. An alternative (complementary) approach is the use of mathematics (mainly calculus and linear algebra) to derive more clear-cut conclusions.

In Microeconomics applications, you will learn to perform optimization exercises for various decision makers (consumers, producers, etc.), and perform comparative statics analysis. In Macroeconomics applications, you will learn to use functions to represent the various sectors of the economy and combine calculus with linear algebra techniques to analyze and compare the effectiveness of fiscal and monetary policies. In the second part of the course you will be introduced to the concept of economic dynamics and the use of differential and difference equations in analyzing the dynamic stability of economic systems.

Intended Learning Outcomes (ILO)

By the end of this course, you (as a student) would be able to:

1. Perform classical unconstrained and constrained optimization, as well as optimization with inequality constraints.
2. Conduct comparative statics exercises to determine the effect of a change in exogenous variables on the endogenous variables in an economic system.
3. Determine stability/instability of a dynamic system by solving differential/difference equations.
4. Apply the above techniques in the context of typical intermediate Microeconomics and Macroeconomics applications.

Course Content

The first part of the course covers various optimization techniques and the notion of equilibrium (as described by the First Order Conditions). In Macroeconomics, the notion of equilibrium applies to various markets in the economy. By performing comparative statics exercises one can determine the effect of exogenous/policy variables on the endogenous variables.

The second part of the course considers dynamic economic systems under the assumption of continuous vs. discrete time. The tool of analysis under the first assumption is the differential equation, while the tool of analysis under the second is the difference equation.

Assessment (includes both continuous and summative assessment)

Continuous Assessment : 100%

Total : 100%

Readings and References

Detailed class notes (slides) will be provided.

Textbook with similar coverage:

CW: A. Chiang and K. Wainwright
Fundamental Methods of Mathematical Economics.
Mc. Graw-Hill International Edition.

Course Instructors

Instructor	Office Location	Email
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Planned Weekly Schedule

Week	Topic	Course LO	Readings/ Activities
1	**Lecture 1:** Review: Calculus and Linear Algebra	1, 2, 4	Class Notes
2	**Lecture 2:** 2.1 Classical Optimization 2.2 Economic applications	1, 2, 4	Class Notes Also covered in: CW Chapters 9, 10, 11
3	**Lecture 3:** 3.1 Comparative Statics – Microeconomic applications 3.2 Comparative Statics in Macroeconomics	1, 2, 4	Class Notes
4	**Lecture 4:** 4.1 Optimization with equality constraints 4.2 Economic applications	1, 2, 4	Class Notes Also covered in: CW Chapter 12
5	**Test 1**	1, 2, 4	Nil

5	**Lecture 5:** 5.1 Non-linear programming and Kuhn-Tucker conditions	1, 2, 4	Class Notes Also covered in: CW Chapter 13
6	**Lecture 6:** 6.1 Non-linear programming – Economic Applications 6.2 Maximum value functions - Envelope Theorem	1, 2, 4	CW Chapter 13 Class Notes Also covered in: CW Chapters 14
7	**Lecture 7:** 7.1 Review of Integral Calculus 7.2 The notion of dynamics 7.3 First order Differential Equations	3, 4	Class Notes Also covered in: CW Chapter 15
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8	**Test 2**	1, 2, 4	Nil
8	**Lecture 8:** 8.1 Economic applications 8.2 Higher order Differential Equations	3, 4	Class Notes Also covered in: CW Chapter 16
9	**Lecture 9:** 9.1 Economic applications 9.2 First order Difference Equations	3, 4	Class Notes Also covered in: CW Chapter 17
10	**Lecture 10:** 10.1 Economic applications 10.2 Second order Difference Equations	3, 4	Class Notes Also covered in: CW Chapter 18
11	**Lecture 11:** 11.1 Second order Difference eqs: Economic applications	3, 4	Nil
12	**Lecture 12:** Review – Question period	3, 4	Nil
13	**Test 3**	3, 4	Nil