



## COURSE SYLLABUS

# Mathematics for Doctoral Economics II, 7.5 credits

*Mathematics for Doctoral Economics II, 7,5 högskolepoäng*

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<b>Course Code:</b> FJMD239	<b>Education Cycle:</b> Third-cycle level
<b>Confirmed by:</b> Research Board Jun 12, 2019	<b>Research subject:</b> Economics
<b>Valid From:</b> Spring 2019	
<b>Version:</b> 1	

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### Purpose

The Mathematics for Doctoral Economics II course is designed to help students be prepared for the mathematical material on dynamic equations that is typically found in the economics (especially macroeconomics) and statistics courses associated with doctoral programme in economics.

### Intended Learning Outcomes (ILO)

On completion of the course, the students will be able to:

#### Knowledge and understanding

- Indicate economic or statistics information that is transmitted by mathematical derivations covered in this course.

#### Skills and abilities

- Determine the equilibria and the out-of-equilibrium properties for linear and nonlinear first-order dynamic univariate equations and for linear higher-order dynamic equations.
- Determine the equilibrium for a first-order linear dynamical system, whether that equilibrium is stable or unstable, and how the dynamical system behaves when not in equilibrium.
- Find the solution to a dynamical system, or to a higher-order dynamic univariate equation.
- Perform dynamic optimization

#### Judgement and approach

- Carry out mathematical derivations within the mathematical material covered with sufficient thoroughness to avoid largely unnecessary mistakes given time constraints.

### Contents

- (i) dynamic univariate equations (difference equations and differential equations), including higherorder linear dynamic equations and first-order nonlinear dynamic equations.
- (ii) phase diagrams
- (iii) stochastic processes.
- (iv) chaos theory.
- (v) linear dynamical systems, including those with spiraling behavior when not in equilibrium.
- (vi) dynamic optimization: calculus of variations, optimal control theory, and dynamic

programming

**Type of instruction**

Lectures and homework assignments.

The teaching is conducted in English.

**Prerequisites**

Admitted to a doctoral programme in economics or a related subject of a recognized business school or university.

**Examination and grades**

The course is graded Fail (U) or Pass (G).

The examination consists of three written examinations, with their percentage contributions to the final

overall grade noted in parentheses below:

- Midterm examination (40%), which covers ILOs 1, 2, 3, 4, 6
- Final examination (60%), which covers ILOs 1, 3, 4, 5, 6

To pass the course the student needs to achieve at least 60% correct of the maximum possible points on

the final overall grade and at least 50% correct on the final examination.

**Course evaluation**

A course evaluation will be conducted at the end of the course.

**Other information**

The course language is English.

**Course literature**

The primary textbook is Chiang, Alpha C. and Wainwright, Kevin C. (2005) *Fundamental Methods of*

*Mathematical Economics* 4th edition, McGraw Hill [ISBN: 007-123823-9]

The course also uses material from Sydsaeter, K., Hammond, P., Seierstad, A. and A. Strom (2008) *Further*

*Mathematics for Economic Analysis*, 2nd ed, Pearson [ISBN: 978-0-273-71328-9], including chapters 8 and 12.

Supplementary material may also be assigned.