



## COURSE SYLLABUS

# Advanced Mathematics for Economics, 7.5 credits

*Advanced Mathematics for Economics, 7,5 högskolepoäng*

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<b>Course Code:</b> JMMR21	<b>Education Cycle:</b> Second-cycle level
<b>Confirmed by:</b> Council for Undergraduate and Masters Education May 28, 2020	<b>Disciplinary domain:</b> Social sciences (75%) and natural sciences (25%)
<b>Valid From:</b> Aug 16, 2021	<b>Subject group:</b> MA1
<b>Version:</b> 1	<b>Specialised in:</b> A1N
	<b>Main field of study:</b> Economics

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### Intended Learning Outcomes (ILO)

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

Knowledge and understanding

1. explain or demonstrate how various mathematical constructs within the covered material can indicate economic and statistical relationships.

Skills and abilities

2. apply economic concepts with a strong mathematical basis that have a broad use for decision making (for example, equilibrium and disequilibrium, stability, dynamic patterns, and the relevance of marginal considerations).

3. determine equilibria in dynamic system, whether each of those equilibria is stable or unstable, and how the dynamic system behaves outside of equilibrium.

4. perform constrained optimization and determine whether that optimization leads to maximization or minimization given the constraint(s).

5. perform standard operations on matrices, such as addition, multiplication, inversion, and finding eigenvalues.

Judgement and approach

6. Evaluate the results of mathematical derivations to determine their economic and/or statistical relevance.

### Contents

Students in this course are presented with mathematical tools for economic and statistical theory,

including matrix algebra and dynamic mathematical systems. It also focuses on mathematical concepts useful for economics courses at the master's level or above.

The contents of this course include

- Matrix algebra: addition, multiplication, and inversion of matrices, eigenvalues, eigenvectors

- Constrained optimization with inequality constraints
- The envelope theorem
- Difference equations
- Differential equations

### Connection to Research and Practice

Mathematics provides a language through which scientists, including social scientists, can communicate their thoughts and results in a succinct way. Theoretical and empirical models in economics use mathematics, so research papers in economics at JIBS that focus on entrepreneurship, renewal, ownership, and other areas will almost always utilize some of the elements of mathematics presented in this course. Without the basic understanding of this course's mathematical tools, master's students in economics will have difficulty understanding many elements in other courses they will study within an economics master's programme. The course demonstrates how mathematical tools can be applied to economic theory and how those tools can be used to support statistical analysis for application to real-world data.

### Type of instruction

The course includes lectures, with exercises discussed during lectures or during separate sessions. Written examinations are also included in the course.

The teaching is conducted in English.

### Prerequisites

The applicants must hold the minimum of a bachelors's degree in Economics equal to 180 credits (or the equivalent).

### Examination and grades

The course is graded A, B, C, D, E, FX or F.

Individual written exam (midterm) (ILOs: 1, 2, 4 and 6) representing 1,5 credits

Individual written exams (ILOs: 1, 2, 3 and 5) representing 6 credits.

Registration of examination:

Name of the Test	Value	Grading
Individual written exam (midterm) <sup>1</sup>	1.5 credits	A/B/C/D/E/FX/F
Individual written exam (final) <sup>1</sup>	6 credits	A/B/C/D/E/FX/F

<sup>1</sup> The final grade of the course is determined by the sum total of points for all parts of examination in the course (0-100 points).

Grade is set in accordance to JIBS grading policy, on a scale A/B/C/D/E/FX.

### Course evaluation

It is the responsibility of the examiner to ensure that each course is evaluated. There must be course evaluators identified among the students. The evaluation is carried out continuously as well as at the end of the course, through a survey. After the course the course Examiner meets with student evaluators to discuss the survey results and possible improvements. A summary report is also created. The report is followed up by program directors and discussed with faculty

and relevant others (e.g. Associate Dean of Education, Associate Dean of faculty, Director of PhD Candidates, Dean, or Director of Studies). The next time the course runs, students should be informed of any measures taken to improve the course based on the previous course evaluation.

### **Other information**

#### **Academic integrity**

JIBS students are expected to maintain a strong academic integrity. This implies to behave within the boundaries of academic rules and expectations relating to all types of teaching and examination.

Copying someone else's work is a particularly serious offence and can lead to disciplinary action. When you copy someone else's work, you are plagiarizing. You must not copy sections of work (such as paragraphs, diagrams, tables and words) from any other person, including another student or any other author. Cutting and pasting is a clear example of plagiarism. There is a workshop and online resources to assist you in not plagiarizing called the Interactive Anti-Plagiarism Guide.

Other forms of breaking academic integrity include (but are not limited to) adding your name to a project you did not work on (or allowing someone to add their name), cheating on an examination, helping other students to cheat and submitting other students work as your own, and using non-allowed electronic equipment during an examination. All of these make you liable to disciplinary action.

### **Course literature**

#### Literature

Chiang, Alpha C. and Wainwright, Kevin C. (2005) *Fundamental Methods of Mathematical Economics* 4th edition, McGraw Hill [ISBN: 007-123823-9], or later edition.

Supplementary material may be used, a full list of which is supplied at the course introduction.