

COURSE SYLLABUS

Advanced Mathematics for Economics, 7.5 credits

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Course Code:	JMMR23	Education Cycle:	Second-cycle level
Confirmed:	Feb 24, 2025	Disciplinary domain:	Social sciences (75%) and Natural sciences (25%)
Valid From:	Sep 01, 2025	Subject group:	Mathematics
		Specialised in:	A1N Second cycle, has only first-cycle course/s as entry requirements
		Main field of study:	Economics

Intended Learning Outcomes (ILO)

On completion of the course the student 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.

Judgment and approach

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

Content

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.

Based on their performance on a midterm test (non-compulsory), students can earn bonus points which will be added to their final exam scores. Bonus points are valid only for the academic year in which they are earned.

Language of instruction is in English.

Entry requirements

A Bachelor's degree equal to 180 credits (or the equivalent), including 60 credits in Economics, and a minimum of 15 credits in mathematics, statistics and/or econometrics (or the equivalent).

Examination and grades

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

Individual written exam (final) (ILOs: 1, 2, 3, 4, 5 and 6) representing 7,5 credits.

All parts of the compulsory examination in the course must be passed with a passing grade (A-E) before a final grade can be set. The final grade of the course is determined by the sum total of points for all parts of the examination in the course (0-100 points). Grades are set in accordance with JIBS grading policy.

Registration of examination:

Name of the Test	Value	Grading
Individual written exam (final)	7.5 credits	A/B/C/D/E/FX/F

Course evaluation

It is the responsibility of the examiner to ensure that each course is evaluated. At the outset of the course, the programme evaluators in the course must be contacted. In the middle of the course, the examiner should meet the programme evaluators to identify strengths/weaknesses in the first half of the course. At the end of the course, the examiner should remind students to fill in the survey. The examiner should also call a meeting with the programme evaluators to debrief the course, based on course evaluation data and comments. The next time the course runs, students should be informed of any measures taken to improve the course based on the previous course evaluations. At the end of each study period, JIBS' Director of Quality and Accreditation crafts a "Course Evaluation Quarter Report", presenting the quantitative results from course evaluation surveys. The Associate Dean of Education, The Associate Deans of Faculty, Programme Directors, and JSA President and Quality receive the report.

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 plagiarising. 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 plagiarising 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

Please note that changes may be made to the reading list up until eight weeks before the start of the course.

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.