

## Syllabus

### Course description

<b>Course title</b>	Mathematics for Economists
<b>Course code</b>	27356
<b>Scientific sector</b>	SECS-S/06
<b>Degree</b>	Bachelor in Economics and Management
<b>Semester and academic year</b>	1st (M1) and 2nd (M2) semester 2024-2025
<b>Year</b>	1
<b>Credits</b>	12 (6+6)
<b>Modular</b>	Yes

<b>Total lecturing hours</b>	72 (36+36)
<b>Total exercise hours</b>	M1 60h - M2 60h
<b>Attendance</b>	Suggested, but not required
<b>Prerequisites</b>	none
<b>Course page</b>	<a href="https://www.unibz.it/it/faculties/economics-management/bachelor-economics-management/">https://www.unibz.it/it/faculties/economics-management/bachelor-economics-management/</a>

<b>Specific educational objectives</b>	<p>The course refers to the basic educational activities and belongs to the scientific area of statistics-mathematics (quantitative methods for decision-making).</p> <p>The course is aimed at creating ability to analyze complex economic phenomena by choosing appropriate analytical methods and retrieving the information necessary for implementing the corresponding decision-making processes.</p>
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<b>Module 1</b>	<b>Mathematics for Economists A</b>
<b>Lecturer</b>	Dr. Paolo Maraner <a href="https://www.unibz.it/it/faculties/economics-management/academic-staff/person/12920-paolo-maraner">https://www.unibz.it/it/faculties/economics-management/academic-staff/person/12920-paolo-maraner</a>
<b>Scientific sector of the lecturer</b>	SECS-S/06
<b>Teaching language</b>	English
<b>Office hours</b>	Please refer to the lecturer's web page
<b>Lecturing assistant</b>	Dr. Luciano Marzufero Prof. Andreas Hamel

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<b>Teaching assistant</b>	-
<b>Office hours</b>	18
<b>List of topics covered</b>	Sets, relations, functions. Basic algebra, numbers, approximations, sequences and their limits, series, geometric series. Real functions (polynomial, rational, irrational, exponential and logarithmic functions), limits of functions, differentiation, linear, quadratic and Taylor approximations, Newton's method, convexity, single variable optimization, integration. Economic applications.
<b>Teaching format</b>	Frontal lessons and exercises
<b>Module 2</b>	<b>Mathematics for Economists B</b>
<b>Lecturer</b>	TBD
<b>Scientific sector of the lecturer</b>	SECS-S/06
<b>Teaching language</b>	English
<b>Office hours</b>	Please refer to the lecturer's web page
<b>Lecturing assistant</b>	Dr. Silvia Bressan 12h/ Dr. Paolo Maraner 48h
<b>Office hours</b>	18
<b>List of topics covered</b>	Functions of two variables: continuity, partial derivatives, directional derivatives, total derivative, linear and quadratic approximations, tangent plane, convexity in terms of second derivatives, homogeneity. Linear algebra: vectors, the scalar product, linear combinations, matrix operations, the transpose, the inverse, definiteness of a matrix, equation of a line and of a plane. Cramer's rule for systems of two equations with two unknowns and its geometric interpretation. Cones; convex, closed and open sets in the Cartesian plane. Implicit function and its derivative, the tangent and the gradient at a point of a level curve. Necessary and sufficient conditions for an unconstrained extreme point. The Lagrange multiplier method and the Kuhn–Tucker theory. Sufficient conditions for the Lagrange multiplier method and nonlinear programming.
<b>Teaching format</b>	Frontal lessons and exercises

<p><b>Learning outcomes</b></p>	<p><u><i>Knowledge and understanding</i></u>          Students acquire knowledge of basic mathematical tools specific to economic analysis. This bulk builds upon their general secondary education. Through considering classical examples (like Cobb – Douglas production function) students learn to understand the interrelations between different topics of the course and their relevance to disciplines in economics and Management. More specifically</p>
	<p><b>M1:</b> Provides the basic mathematical tools concerning functions of one variable and static models. The corresponding skills, allow, on the one hand, to understand and analyze the corresponding economic mechanisms and, on the other hand, they create a base for M2 part.</p> <p><b>M2:</b> Comprises intermediate mathematical tools necessary to understand and analyze economic mechanisms through theoretical and empirical models described by functions of several variables. Particular learning outcomes include: understanding of comparative static analysis, use of the Lagrangian method in cost/utility optimization.</p> <p><u><i>Applying knowledge and understanding</i></u>  <b>M1:</b> Ability to apply calculus in analyzing the behavior of economic agents through both normative and descriptive models.</p> <p><b>M2:</b> Mastering intermediate mathematical tools in analyzing behavior of economic agents, from both theoretical and empirical points of view. Ability to formalize simple economic problems through mathematical models, to find solutions and to interpret them.</p> <p><u><i>Making judgments</i></u>          Within the scope of mathematical modelling, students learn to explain the outcome in terms of the corresponding social, scientific or ethical issues.</p> <p><u><i>Communication skills</i></u>          The course provides skills necessary for a presentation of ideas, problems and solutions based on the acquired mathematical skills to both specialist and non-specialist audiences.</p> <p><u><i>Learning skills</i></u>          The course creates a base of knowledge and learning skills (acquired through class work, exercises and individual study supervised by the lecturer and teaching assistant) necessary to continue with a high degree of autonomy a further study in economics and management.</p>

<b>Assessment</b>	<p>M1: A written final exam (questions and problems to solve) which counts 100% for the M1 partial grade.</p> <p>M2: A written final exam (questions and problems to solve) which counts 100% for the M2 partial grade.</p>
<b>Assessment language</b>	English
<b>Evaluation criteria and criteria for awarding marks</b>	<p>Final grade: 50% grade for M1 partial grade, 50% for M2 partial grade. The results of assignments and partial exams are only valid for the academic year in question. They cannot be carried over beyond that time frame.</p>
<b>Required readings</b>	<p>K. Sydsaeter and P.J. Hammond – <i>Mathematics for Economic Analysis</i>, Prentice Hall, 1995. Other editions of variants of this book, under slightly different titles, are suitable as well.</p>
<b>Supplementary readings</b>	<p>M1: Teaching material on Reserve Collection (lecture slides, additional practice problems, references). M2: tbd</p>