Syllabus
Course description

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

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

Specific educational objectives	The course refers to the basic educational activities and belongs to the scientific area of statistics-mathematics (quantitative methods for decision-making). 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.

Module 1	**Mathematics for Economists A**
Lecturer	Dr. Paolo Maraner https://www.unibz.it/it/faculties/economics-management/academic-staff/person/12920-paolo-maraner
Scientific sector of the lecturer	SECS-S/06
Teaching language	English
Office hours	Please refer to the lecturer's web page
Lecturing assistant	Dr. Luciano Marzufero Prof. Andreas Hamel

Teaching assistant	-
Office hours	18
List of topics covered	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.
Teaching format	Frontal lessons and exercises

Module 2	**Mathematics for Economists B**
Lecturer	Prof. Martin Meier
Scientific sector of the lecturer	SECS-S/06
Teaching language	English
Office hours	Please refer to the lecturer's web page
Lecturing assistant	Dr. Silvia Bressan 12h/ Dr. Paolo Maraner 48h
Office hours	18
List of topics covered	1. Matrix calculus, rank and linear independence, systems of linear equations, Gaussian elimination, applications. 2. Functions of several variables: gradients, Hesse matrices, Taylor approximation, convexity. 3. Multivariable optimization, Lagrange method and economic applications. Simple least square regression. 4. If enough time remains: Basics of probability theory.
Teaching format	Frontal lessons and exercises

Learning outcomes	*Knowledge and understanding*
	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

M1: 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.

M2:
Knowledge and understanding of basic concepts in linear algebra: matrices and matrix calculus, vectors and their geometrical applications, systems of linear equations.
Knowledge and understanding of functions of several variables: partial derivatives and gradients, convexity.
Knowledge and understanding of optimization problems for several variables: optimality concepts and conditions for the unconstrained as well as the constrained case, Lagrangian method.

Applying knowledge and understanding
M1: Ability to apply calculus in analyzing the behavior of economic agents through both normative and descriptive models.
M2:
Understanding of the basic facts needed to follow modern courses in economics, business and administration.
Understanding mathematical problems and ideas for their solutions.
Ability to define economic problems with several variables in a formalized approach; ability to find (optimal) solutions and to interpret results, being informed by existing theories.
Ability to use mathematical tools for the analysis of static and dynamic multi-variable models.
Ability to use matrices for data representation and how to manage them for transformations and calculus.

Making judgments
Within the scope of mathematical modelling, students learn to explain the outcome in terms of the

corresponding social, scientific or ethical issues.
M2:
Ability to interpret results obtained for linear
mathematical models for economic systems involving
matrix structures
Ability to interpret results obtained for multli-variable
mathematical models for economic systems

Communication skills
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.

M2:
Understanding of matrix calculus and ability to
communicate ideas, problems and solutions for linear
models
Understanding of multi-variable economic models and
the ability to communicate ideas, problems and
solutions for such models

Learning skills
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.
M2:
Develop skills for the study of more complex linear and
nonlinear mathematical structures in an economic
environment
Develop skills for the solution of more advanced
mathematical problems related to economical models

Assessment	M1: A written final exam (questions and problems to solve) which counts 100% for the M1 partial grade.
	M2: A written final exam (questions and problems to solve) which counts 100% for the M2 partial grade.
	There is no different assessment for attending and non-attending students.

Assessment language	English
Evaluation criteria and criteria for awarding marks	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.

Required readings	K. Sydsaeter and P.J. Hammond – *Mathematics for Economic Analysis*, Prentice Hall, 1995. Other editions of variants of this book, under slightly different titles, are suitable as well.
Supplementary readings	M1: Teaching material on Reserve Collection (lecture slides, additional practice problems, references). M2: Teaching material on Reserve Collection (lecture slides, references and possibly additional practice problems)