Freie Universität Bozen
Libera Università di Bolzano
Università Liedia de Bulsan

Syllabus
Course Description

Course title	Mathematics for Economists TSE (modular)
Course code	30162
Scientific sector	SECS-S/06
Degree	Bachelor in Tourism, Sport and Event Management
Semester and academic year	1st and 2nd Semester 2024/25
Year	1st year
Credits	12
Modular	Yes

Total lecturing hours	72
Total lab hours	-
Total exercise hours	72
Attendance	suggested, but not required
Prerequisites	Not requested; the "Preparatory course in Mathematics" is recommended
Course page	https://www.unibz.it/it/faculties/economics-management/bachelor-tourism-sport-event-management/course-offering/?academicYear=2024

Specific educational objectives	The first module refers to the basic educational activities and belongs to the scientific area of Statistics-Mathematics. The second module refers to typical educational activities and belongs to the scientific area of Statistics-Mathematics. The course gives an introduction to scientific content in Mathematics and is designed to acquire skills for the solution of basic mathematical tasks as well as for modeling economic systems. The first module is the first part of an introductory course which covers basics in mathematical language (sets, relations, functions) as well as one-variable calculus. The course is intended as a first step in providing students with solid mathematical foundations to be of use in modelling economical systems, in market research and in the analysis of consumer behaviour. The students will be provided with the basic facts needed to follow modern courses in economics, business and administration. The focus is on understanding the mathematical problems and ideas for their solutions. Solution procedures for several standard problems (for example, find a derivative, the equation of a tangent to a function, an indefinite integral or perform Newton's method) will be introduced. The course is aimed at generating familiarity with and proficiency in applying these solution procedures.

	A graphical approach is chosen if possible and (economic) examples will be discussed. The second module is the second part of an introductory course that covers improper integrals, an introduction to linear algebra as well as multivariable calculus and optimization. The course is intended as a second step in providing students with solid mathematical foundations to be of use in modelling economic systems, in market research and in the analysis of consumer behaviour. The students will be provided with the basic facts needed to follow modern courses in economics, business and administration. The focus is on understanding the mathematical problems and ideas for their solutions. Solution procedures for several standard problems (for example, find solutions for systems of linear equations, gradients of multi-variable functions, solutions of (constrained) multi-variable optimization problems, probabilities for events) will be introduced. The course is aimed at generating familiarity with and proficiency in applying these solution procedures. A graphical approach is chosen if possible and (economic) examples will be discussed.

Module 1	M-1 Mathematics for Economists TSE
Lecturer	Prof. Dr. rer. nat. habil. Andreas Hamel E-mail: Andreas.Hamel@unibz.it, Phone: 0474 013651 Campus Bruneck- Brunico, 1st Floor, Room 1.11; https://www.unibz.it/en/faculties/economics-management/academic-staff/person/33708-andreas-heinrich-hamel
Scientific sector of the lecturer	SECS-S/06
Teaching language	English
Office hours	https://www.unibz.it/en/timetable/?department=26&degree=13009%2C13134
Lecturing assistant	Weißing Benjamin
Teaching assistant	-
Office hours	-
List of topics covered	1. Basic mathematical concepts: sets, relations, functions, numbers, limits, absolute values. 2. Functions of one variable: basic properties, derivatives and their calculus, Taylor approximations, Newton's method. A brief introduction of partial derivatives. Applications to problems in Economics/Management. 3. Elementary probability measures over algebras of sets. 4. Convexity and single-variable optimization (Fermat's rule and sufficient optimality conditions). Applications to problems in Economics/Management. 5. Elements of integration.

Teaching format	Lectures, homework and class exercises.

Module 2	M-2 Mathematics for Economists TSE
Lecturer	Prof. Dr. rer. nat. habil. Andreas Hamel E-mail: Andreas.Hamel@unibz.it, Phone: 0474 013651 Campus Bruneck- Brunico, 1st Floor, Room 1.11 https://www.unibz.it/en/faculties/economics-management/academic-staff/person/33708-andreas-heinrich-hamel
Scientific sector of the lecturer	SECS-S/06
Teaching language	English
Office hours	https://www.unibz.it/en/timetable/?department=26&degree=13009%2C13134
Lecturing assistant	TBD
Teaching assistant	-
Office hours	-
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. Basics of probability theory.
Teaching format	Lectures, homework and class exercises.

Learning outcomes	**Knowledge and understanding** Mathematics for Economists M1: • Knowledge and understanding of basic mathematical concepts: sets and set operations, relations and their properties, general functions, numbers and elementary equations/inequalities. • Knowledge and understanding of functions of one real variable: basic properties, derivatives and their calculus including 1st order partial derivatives. • Knowledge and understanding of single-variable optimization problems: optimality notions and conditions, convexity, algorithmic approach. • Knowledge and understanding of integrals for single-variable functions: indefinite integrals, definite integrals and area, integral calculus. • Knowledge and understanding of the mathematical lexicon in English. Mathematics for Economists 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

Mathematics for Economists M1:

- Understanding of the basic facts needed to follow modern courses in economics, business and administration.
- Understanding mathematical problems and model.
- Ability to differentiate and integrate real functions, ability to solve single-variable optimization problems.
- Ability to define economic problems in a formalized approach; 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 models.

Mathematics for Economists 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

Mathematics for Economists M1:

- Ability to make informed judgments about the relevance of sets vs. relations vs. functions in economic models
- Ability to interpret results obtained for single-variable mathematical models for economic systems

Mathematics for Economists 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** Mathematics for Economists M1: • Basic understanding of fundamental mathematical language • Understanding of and ability to communicate ideas, problems and solutions for mathematical models involving single-variable real functions Mathematics for Economists 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** Mathematics for Economists M1: • Develop skills for the study of basic mathematical structures in an economic environment • Develop skills for the solution of basic mathematical problems related to economical models Mathematics for Economists 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	Written and independent problem solving work: written exam of maximal 120min at the end of each module; take home assignments in each module. There is no different assessment for attending and non-attending students; the assignments will be posted online (on Reserve Collection, OLE).
Assessment language	English
Evaluation criteria and criteria for awarding marks	**Three** assignments throughout each module (count **30%** toward the final grade) and a final exam (counts **70%** toward the final grade). Enrolled students who do not

	attend the classes still have to hand in the solutions of the assignments and attend the final exam. Results of assignments are only valid for the academic cycle in which these activities have taken place and results of these activities cannot be carried over beyond that time frame.

Required readings	Lecture notes/slides will be provided in due course. Further readings will be announced at the beginning of the course.
Supplementary readings	Will be announced in due course if necessary.