Syllabus
Course Description

Course title	Mathematics for Economists (modular)
Course code	30101
Scientific sector	SECS-S/06
Degree	Bachelor in Tourism, Sport and Event Management
Semester and academic year	1st and 2nd Semester 2018/2019
Year	1st year
Credits	12
Modular	Yes

Total lecturing hours	72
Total lab hours	-
Total exercise hours	78
Attendance	suggested, but not required
Prerequisites	Not requested; the "Preparatory course in Mathematics" is recommended
Course page	https://www.unibz.it/en/faculties/economics-management/bachelor-tourism-sport-event-management/course-offering/?academicYear=2018

Specific educational objectives	The first module refers to the basic and typical educational activities and belongs to the scientific area of Statistics-Mathematics.
	The second module refers to basic and 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 many (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 and to probability theory 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 many (economic) examples will be discussed.

Module 1	M-1 Mathematics for Economists A
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/
Lecturing assistant	Daniela Visetti E-mail: Daniela.Visetti@unibz.it Campus Bruneck-Brunico, 1st Floor, Room 1.08 https://www.unibz.it/en/faculties/economics-management/academic-staff/person/31659-daniela-visetti
Teaching assistant	-
Office hours	-
List of topics covered	1. Basic mathematical concepts: sets, relations, functions, numbers, limits 2. Functions of one variable: basic properties, derivatives and their calculus, Taylor's formula, Newton's method. 3. Convexity and single-variable optimization. 4. Elements of integration.
Teaching format	Lectures, homework and class exercises.

Module 2	M-2 Mathematics for Economists B
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/
Lecturing assistant	Daniela Visetti E- mail: Daniela.Visetti@unibz.it Campus Bruneck-Brunico, 1st Floor, Room 1.08 https://www.unibz.it/en/faculties/economics-management/academic-staff/person/31659-daniela-visetti
Teaching assistant	-
Office hours	-
List of topics covered	1. Matrix calculus, systems of linear equations, Gaussian elimination, geometrical applications 2. Functions of several variables: partial derivatives and gradients, convexity 3. Multivariable optimization, Lagrange method 4. Probability measures, random variables, distributions and their parameters
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 variable: basic properties, derivatives and their calculus. • 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.
- Knowledge and understanding of the basic concepts in probability theory: probability measures, distributions and their parameters (expected value, variance etc.).

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.
- Understanding of probability theory to be used in inferential statistics and hypothesis testing.

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
	• Basic understanding of probabilistic models
	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 economical 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 economical 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 economical environment
	• Develop skills for the solution of more advanced mathematical problems related to economical models

Assessment	Written and independent problem solving work: written

	exam at the end of each module; regular assignments in due the respective semesters. There is no different assessment for attending and non-attending students; the assignments will be posted online (on Reserve Collection), their solutions can be submitted via email.
Assessment language	English
Evaluation criteria and criteria for awarding marks	Four assignments throughout each semester (count 35% toward the final grade) and a final exam (counts 65% toward the final grade). Enrolled students who do not attend the classes still have to hand in the solutions 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 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.