Syllabus

Course Description

Course Title	Mathematics for EPE
Course Code	27279
Course Title Additional	
Scientific-Disciplinary Sector	
Language	English
Degree Course	Bachelor in Economics, Politics and Ethics
Other Degree Courses (Loaned)	
Lecturers	dr. Luciano Marzufero, Luciano.Marzufero@unibz.it https://www.unibz.it/en/faculties/economics-management/academic-staff/person/49853 Prof. Dr. Martin Meier, Martin.Meier@unibz.it https://www.unibz.it/en/faculties/economics-management/academic-staff/person/50913 Dr. Paolo Maraner, PMaraner@unibz.it https://www.unibz.it/en/faculties/economics-management/academic-staff/person/12920
Teaching Assistant	
Semester	All semesters
Course Year/s	1
CP	12
Teaching Hours	72 (36 + 36)
Lab Hours	72 (36 + 36)
Individual Study Hours	-
Planned Office Hours	36 (18 + 18)
Contents Summary	Mathematics A This course introduces the fundamental concepts of mathematical analysis, starting from the basic language of sets, functions, and

	numbers. It develops tools for the study of single-variable functions, including limits, derivatives, Taylor expansions, and other properties. Optimization in one dimension and basic notions of convexity are also covered, together with an introduction to integral calculus. Mathematics B This course builds on the foundations of Mathematics A and extends them to multivariable contexts. It covers linear algebra techniques and the study of functions of several variables, including gradients and other properties. Topics also include convexity/concavity and optimization methods, with special emphasis on the Lagrange method and applications in economics. Time permitting, a short introduction to probability theory is provided.
Course Topics	MATHEMATICS A: 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. 3. Convexity and single-variable optimization (Fermat's rule and sufficient optimality conditions). 4. Elements of integration (indefinite, definite and improper). MATHEMATICS B: 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 and concavity. 3. Multivariable optimization, Lagrange method and economic applications. 4. If enough time remains: Basics of probability theory.
Keywords	sets; relations; functions; limits; derivatives; Taylor approximations; Newton's method; optimization; integration;

	matrix calculus; system of linear equations; Gaussian elimination method; gradients; multivariable optimization; Lagrange method.
Recommended Prerequisites	
Propaedeutic Courses	None
Teaching Format	Lectures and exercise sessions
Mandatory Attendance	Suggested, but not mandatory
Specific Educational Objectives and Learning Outcomes	Knowledge and understanding By the end of the course, students will have acquired the following knowledge and understanding: - knowledge of mathematical techniques for solving optimisation problems; - knowledge of probabilistic and inferential tools for using statistical models; - ability to model social and economic phenomena; - ability to give an economic interpretation to the results of the various mathematical-statistical models applied to economics; - basic knowledge of data management and computer programming for statistical and econometric analysis of socio-economic data - knowledge of the technical vocabulary of the subjects in this learning area. Applying knowledge and understanding: - ability to calculate derivatives and partial derivatives - ability to calculate limits and sums of series; - ability to use quantitative methods to solve problems in economics; - ability to read, write and communicate in the technical language of quantitative methods in the three official languages of instruction Autonomy of judgement Acquisition of the capacity for judgement and of the methodological tools useful for the critical analysis of data, sources, assumptions and implications of scientific practice, of the political, ethical and legal context within which economic phenomena are inscribed and with which they interact Communication skills

	The course contributes to reaching the following objectives: fluency (oral and written) in Italian, German and English, including translation between these languages. Intercultural competence. Conceptual awareness, ability to summarise and express oneself in writing, particularly with regard to the drafting of scientific or science-based documents Learning skills Promotion of critical thinking and analytical skills to focus on complex problems in their long-term dynamics and in the variety of their implications, including ethical ones
Specific Educational Objectives and Learning Outcomes (additional info.)	
Assessment	A written final exam (questions and problems to solve) covering both M1 and M2 parts (M1 partial exam and M2 partial exam, respectively). Written exam of maximal 120min at the end of each module. There is no different assessment for attending and non-attending students.
Evaluation Criteria	Final grade: 50% grade for M1 partial exam, 50% for M2 partial exam. The grades of partial exams are only valid for the academic year in question. They cannot be carried over beyond that time frame.
Required Readings	• Lecture notes provided in due course (available in the Reserve Collection) • L. Peccati, S. Salsa, A. Squellati, "Mathematics for Economics and Business", Bocconi University Press, 2016. • Further readings will be announced at the beginning of the course.
Supplementary Readings	
Further Information	
Sustainable Development Goals (SDGs)	Partnerships fot the goals, Quality education

Course Module

Course Constituent Title	Mathematics A for EPE

Course Code	27279A
Scientific-Disciplinary Sector	SECS-S/06
Language	English
Lecturers	Prof. Dr. Martin Meier, Martin.Meier@unibz.it https://www.unibz.it/en/faculties/economics-management/academic-staff/person/50913 dr. Luciano Marzufero, Luciano.Marzufero@unibz.it https://www.unibz.it/en/faculties/economics-management/academic-staff/person/49853
Teaching Assistant	
Semester	First semester
CP	6
Responsible Lecturer	
Teaching Hours	36
Lab Hours	36
Individual Study Hours	-
Planned Office Hours	18
Contents Summary	The course "Mathematics A for EPE M1" deals with basic mathematical concepts like sets, relations, functions, numbers, limits and absolute values. Moreover we will introduce functions of one variable by studying their basic properties, derivatives and their calculus, Taylor approximations and the Newton's method. We will also address the single-variable optimization (Fermat's rule and sufficient optimality conditions) and the elements of integration.
Course Topics	
Teaching Format	Lectures and exercise sessions
Required Readings	Lecture notes provided in due course (available in the Reserve Collection) L. Peccati, S. Salsa, A. Squellati, Mathematics for Economics and Business, Bocconi University Press, 2016.
Supplementary Readings	

Course Module

Course Constituent Title	Mathematics B for EPE
Course Code	27279B
Scientific-Disciplinary Sector	SECS-S/06
Language	English
Lecturers	Dr. Paolo Maraner, PMaraner@unibz.it https://www.unibz.it/en/faculties/economics-management/academic-staff/person/12920 Prof. Dr. Martin Meier, Martin.Meier@unibz.it https://www.unibz.it/en/faculties/economics-management/academic-staff/person/50913
Teaching Assistant	
Semester	Second semester
CP	6
Responsible Lecturer	
Teaching Hours	36
Lab Hours	-
Individual Study Hours	-
Planned Office Hours	18
Contents Summary	Matrix calculus, rank and linear independence, systems of linear equations, Gaussian elimination, applications. • Functions of several variables: gradients, Hesse matrices, Taylor approximation, convexity and concavity. • Multivariable optimization, Lagrange method and economic applications. • If enough time remains: Basics of probability theory.
Course Topics	
Teaching Format	Lectures and exercise sessions.
Required Readings	Lecture notes provided in due course (available in the Reserve Collection)

Supplementary Readings	