Syllabus

Kursbeschreibung

Titel der Lehrveranstaltung	Mathematik für ÖPE
Code der Lehrveranstaltung	27279
Zusätzlicher Titel der Lehrveranstaltung	
Wissenschaftlich-disziplinärer Bereich	
Sprache	Englisch
Studiengang	Bachelor in Ökonomie, Politik und Ethik
Andere Studiengänge (gem. Lehrveranstaltung)	
Dozenten/Dozentinnen	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, Paolo.Maraner@unibz.it https://www.unibz.it/en/faculties/economics-management/academic-staff/person/12920
Wissensch. Mitarbeiter/Mitarbeiterin	
Semester	Alle Semester
Studienjahr/e	1
KP	12
Vorlesungsstunden	72 (36 + 36)
Laboratoriumsstunden	72 (36 + 36)
Stunden für individuelles Studium	-

Vorgesehene Sprechzeiten	36 (18 + 18)
Inhaltsangabe	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.
Themen der Lehrveranstaltung	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.
Stichwörter	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.
Empfohlene Voraussetzungen	
Propädeutische Lehrveranstaltungen	None
Unterrichtsform	Lectures and exercise sessions
Anwesenheitspflicht	Suggested, but not mandatory
Spezifische Bildungsziele und erwartete Lernergebnisse	ILO (Intended Learning Outcomes) - M-1 Mathematics A for EPE ILO 1 Knowledge and understanding ILO 1.1 knowledge of mathematical techniques for solving optimisation problems; ILO 1.2 knowledge of the technical vocabulary of the subjects of this learning area; ILO 2 Applying knowledge and understanding: ILO 2.1 ability to calculate derivatives and partial derivatives; ILO 2.2 ability to calculate limits and sums of series; ILO 2.3 ability to use quantitative methods to solve problems in economics; ILO 2.4 ability to read, write and communicate in the technical language of quantitative methods in the three official languages of instruction; ILO 3 Autonomy of judgement ILO 3.1 Acquisition of the ability to judge 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 set and with which they interact

	ILO 4 Communication skills ILO 4.1 Proficiency (oral and written) in Italian, German and English, including translation between these languages. Intercultural competence. Conceptual awareness, synthesis and written expression, in particular in the drafting of scientific or science-based documents ILO 5 Learning skills ILO 5.1 Promotion of critical thinking and analytical skills to focus on complex problems in their long-term dynamics and the variety of their implications, including ethical ones ILO (Intended Learning Outcomes) - M-2 Mathematics B for EPE ILO 1 Knowledge and understanding ILO 1.1 knowledge of mathematical techniques for solving optimisation problems; ILO 1.2 knowledge of probabilistic and inferential tools for using statistical models; ILO 1.3 knowledge of the technical vocabulary of the subjects of this learning area. ILO 2 Applying knowledge and understanding: ILO 2.1 ability to calculate derivatives and partial derivatives; ILO 2.2 ability to calculate limits and sums of series; ILO 2.3 ability to use quantitative methods to solve problems in economics; ILO 2.4 ability to read, write and communicate in the technical language of quantitative methods in the three official languages of instruction; ILO 3 Autonomy of judgement ILO 3.1 Acquisition of the ability to judge 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 set and with which they interact ILO 4 Communication skills ILO 4.1 Proficiency (oral and written) in Italian, German and English, including translation between these languages. Intercultural competence. Conceptual awareness, synthesis and written expression, in particular in the drafting of scientific or science-based documents ILO 5 Learning skills ILO 5.1 Promotion of critical thinking and analytical skills to focus on complex problems in their long-term dynamics and the variety of their implications, including ethical ones
Spezifisches Bildungsziel und erwartete Lernergebnisse (zusätzliche Informationen)	
Art der Prüfung	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.
Bewertungskriterien	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.
Pflichtliteratur	• 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.
Weiterführende Literatur	

Weitere Informationen	
Ziele für nachhaltige Entwicklung (SDGs)	Partnerschaften zur Erreichung der Ziele, Hochwertige Bildung

Kursmodul

Titel des Bestandteils der Lehrveranstaltung	Mathematik A für ÖPE
Code der Lehrveranstaltung	27279A
Wissenschaftlich-disziplinärer Bereich	STAT-04/A
Sprache	Englisch
Dozenten/Dozentinnen	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
Wissensch. Mitarbeiter/Mitarbeiterin	
Semester	Erstes Semester
KP	6
Verantwortliche/r Dozent/in	
Vorlesungsstunden	36
Laboratoriumsstunden	36
Stunden für individuelles Studium	-
Vorgesehene Sprechzeiten	18
Inhaltsangabe	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.

Themen der Lehrveranstaltung	MATHEMATICS A for EPE: 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).
Unterrichtsform	Lectures and exercise sessions
Pflichtliteratur	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.
Weiterführende Literatur	

Kursmodul

Titel des Bestandteils der Lehrveranstaltung	Mathematik B für ÖPE
Code der Lehrveranstaltung	27279B
Wissenschaftlich-disziplinärer Bereich	STAT-04/A
Sprache	Englisch
Dozenten/Dozentinnen	Dr. Paolo Maraner, Paolo.Maraner@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
Wissensch. Mitarbeiter/Mitarbeiterin	
Semester	Zweites Semester
KP	6
Verantwortliche/r Dozent/in	

Vorlesungsstunden	36
Laboratoriumsstunden	-
Stunden für individuelles Studium	-
Vorgesehene Sprechzeiten	18
Inhaltsangabe	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.
Themen der Lehrveranstaltung	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.
Unterrichtsform	Lectures and exercise sessions.
Pflichtliteratur	Lecture notes provided in due course (available in the Reserve Collection)
Weiterführende Literatur	