Freie Universität Bozen
Libera Università di Bolzano
Università Liedia de Bulsan

Syllabus
Course description

Course title	Mathematics for EPE
Course code	27279
Scientific sector	SECS-S/06
Degree	Bachelor in Economics, Politics and Ethics
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 lab hours	72 (36+36)
Total exercise hours	none
Attendance	Suggested, but not required
Prerequisites	none
Course page	https://www.unibz.it/it/faculties/economics-management/bachelor-economics-politics-ethics

Specific educational objectives	The course refers to the basic (M1) and typical (M2) 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 A for EPE M1
Lecturer	Luciano Marzufero Office BZ I3.06 luciano.marzufero@unibz.it https://www.unibz.it/it/faculties/economics-management/academic-staff/person/49853-luciano-marzufero
Scientific sector of the lecturer	STAT-04/A
Teaching language	English
Office hours	18 hours Cockpit – students' zone – individual timetable Webpage: https://www.unibz.it/en/timetable/?sourceId=unibz&department=26&degree=13141%2C13182
Lecturing assistant	Osatohanmwen Patrick patrick.osatohanmwen@unibz.it

	https://www.unibz.it/it/faculties/economics-management/academic-staff/person/48845-patrick-osatohanmwen
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. Applications to problems in Economics/Management. 3. Convexity and single-variable optimization (Fermat's rule and sufficient optimality conditions). Applications to problems in Economics/Management. 4. Elements of integration. 5. Basics of probability theory.
Teaching format	Lectures, homework and class exercises

Module 2	Mathematics B for EPE M2
Lecturer	Martin Meier Office E3.09 Martin.Meier@unibz.it https://www.unibz.it/it/faculties/economics-management/academic-staff/person/50913-martin-meier
Scientific sector of the lecturer	STAT-04/A
Teaching language	English
Office hours	18 hours Cockpit – students' zone – individual timetable Webpage: https://www.unibz.it/en/timetable/?sourceId=unibz&department=26&degree=13141%2C13182
Lecturing assistant	Paolo Maraner Office E5.23 Paolo.Maraner@unibz.it https://www.unibz.it/de/faculties/economics-management/academic-staff/person/12920-paolo-maraner
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** Mathematics A for EPE 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.
- 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 basics in probability theory: probability measures and random variables, expected value, variance and standard deviation, distribution functions.
- Knowledge and understanding of the mathematical lexicon in English.

Mathematics B for EPE 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 B for EPE 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. Mathematics B for EPE 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. Mathematics B for EPE 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. Mathematics B for EPE 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	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.
Assessment language	English
Evaluation criteria and criteria for awarding marks	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	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. Lecture notes/slides will be provided in due course. Further readings will be announced at the beginning of the course.
Supplementary readings	M2: Teaching material on Reserve Collection (lecture slides, references and possibly additional practice problems)