Freie Universität Bozen
Libera Università di Bolzano
Università Liedia de Bulsan

# Syllabus
# Course description

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| **Course title** | Mathematics for EPE |
| **Course code** | 27279 |
| **Scientific sector** | STAT-04/A (ex SECS-S/06) |
| **Degree** | Bachelor in Economics, Politics and Ethics |
| **Semester and academic year** | 1st (M1) and 2nd (M2) semester 2025-2026 |
| **Year** | 1 |
| **Credits** | 12 (6+6) |
| **Modular** | Yes |

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| **Total lecturing hours** | 72 (36+36) |
| **Total lab hours** | 60 (30+30) |
| **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 |

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| **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).<br>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. |

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| **Module 1** | Mathematics A for EPE M1 |
| **Lecturer** | Luciano Marzufero<br>Office BZ I3.06<br>luciano.marzufero@unibz.it<br>https://www.unibz.it/it/faculties/economics-management/academic-staff/person/49853-luciano-marzufero<br><br>Martin Meier<br>Office E3.09<br>Martin.Meier@unibz.it<br>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 |

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| **Office hours** | 18 hours<br>Cockpit – students' zone – individual timetable<br>Webpage:<br>https://www.unibz.it/en/timetable/?sourceId=unibz&department=26&degree=13141%2C13182 |
| **Lecturing assistant** | - |
| **List of topics covered** | 1. Basic mathematical concepts: sets, relations, functions, numbers, limits, absolute values.<br>2. Functions of one variable: basic properties, derivatives and their calculus, Taylor approximations, Newton's method.<br>3. Convexity and single-variable optimization (Fermat's rule and sufficient optimality conditions).<br>4. Elements of integration. |
| **Teaching format** | Lectures, homework and class exercises |

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| **Module 2** | Mathematics B for EPE M2 |
| **Lecturer** | Martin Meier<br>Office E3.09<br>Martin.Meier@unibz.it<br>https://www.unibz.it/it/faculties/economics-management/academic-staff/person/50913-martin-meier |
| **Scientific sector of the lecturer** | STAT-04/A (ex SECS-S/06) |
| **Teaching language** | English |
| **Office hours** | 18 hours<br>Cockpit – students' zone – individual timetable<br>Webpage:<br>https://www.unibz.it/en/timetable/?sourceId=unibz&department=26&degree=13141%2C13182 |
| **Lecturing assistant** | tba |
| **List of topics covered** | 1. Matrix calculus, rank and linear independence, systems of linear equations, Gaussian elimination, applications.<br>2. Functions of several variables: gradients, Hesse matrices, Taylor approximation, convexity.<br>3. Multivariable optimization, Lagrange method and economic applications. Simple least square regression.<br>4. If enough time remains: Basics of probability theory. |
| **Teaching format** | Frontal lessons and exercises |

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| **Learning outcomes** | **Knowledge and understanding**<br>Mathematics A for EPE M1:<br>• Knowledge and understanding of basic mathematical concepts: sets and set operations, relations and their properties, general functions, numbers and elementary equations/inequalities.<br>• 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

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| | corresponding social, scientific or ethical issues.<br><br>Mathematics B for EPE M2:<br>• Ability to interpret results obtained for linear mathematical models for economic systems involving matrix structures<br>• Ability to interpret results obtained for multli-variable mathematical models for economic systems<br><br>**Communication skills**<br><br>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.<br><br>Mathematics B for EPE M2:<br>• Understanding of matrix calculus and ability to communicate ideas, problems and solutions for linear models<br>• Understanding of multi-variable economic models and the ability to communicate ideas, problems and solutions for such models<br><br>**Learning skills**<br><br>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.<br><br>Mathematics B for EPE M2:<br>• Develop skills for the study of more complex linear and nonlinear mathematical structures in an economic environment<br>• Develop skills for the solution of more advanced mathematical problems related to economical models |

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| **Assessment** | A written final exam (questions and problems to solve) covering both M1 and M2 parts (M1 partial exam and M2 partial exam, respectively).<br>Written exam of maximal 120min at the end of each module.<br>There is no different assessment for attending and non-attending students. |

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| **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. |

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| **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.<br>Lecture notes/slides will be provided in due course.<br>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) |