Syllabus

Course Description

Course Title	Introduction to Analysis and Optimization Techniques
Course Code	76436
Course Title Additional	
Scientific-Disciplinary Sector	MATH-03/A
Language	English
Degree Course	Bachelor in Informatics and Management of Digital Business
Other Degree Courses (Loaned)	
Lecturers	dr. Andrea Mazzullo, Andrea.Mazzullo@unibz.it https://www.unibz.it/en/faculties/engineering/academic-staff/person/38537
Teaching Assistant	
Semester	Second semester
Course Year/s	1
CP	6
Teaching Hours	40
Lab Hours	20
Individual Study Hours	90
Planned Office Hours	18
Contents Summary	- Sequences and series - Univariate functions - Derivatives and differentials - Indefinite and Riemann integrals - Basic optimization techniques in one variable - Mathematical tools for decision making without and with uncertainty
Course Topics	• Sequences and series: definitions and basic properties of sequences and series of real numbers. • Univariate functions: definitions and basic properties of real

	functions in one variable, limits, continuity. • Derivatives and differentials: definitions and main theorems of differential calculus. • Indefinite and Riemann integrals: definitions and main theorems of integral calculus. • Basic optimization techniques in one variable: study of functions, local and global extrema, first and second derivative tests, standard form of optimization problems, Taylor polynomials, Newton's method. • Mathematical tools for decision making without and with uncertainty: sets and relations, principle of mathematical induction, basics of Combinatorics, Newton's Binomial Theorem, Pascal's Triangle, hints on Multivariate Calculus and applications.
Keywords	Mathematical Analysis, Optimization Techniques
Recommended Prerequisites	None.
Propaedeutic Courses	
Teaching Format	• Frontal classroom lectures • Lab exercises In the lectures, concepts and techniques are introduced, both by presenting notions on the blackboard and by collectively discussing related exercises and examples. In the labs, students (either in small groups, or individually) develop possible approaches to address the exercises proposed by the lecturer and compare their solutions with the rest of the class.
Mandatory Attendance	Attendance is not compulsory, but highly encouraged. All the material used in the lectures and in the labs will be made available on the MS Teams of the course. However, students should note that an active engagement in understanding the theoretical notions and in finding solutions to the exercises is required to reach the learning outcomes of the course.
Specific Educational Objectives and Learning Outcomes	The course belongs to the type "di base – formazione matematico-fisica". The course offers an introduction to the fundamental concepts and techniques of elementary calculus, mathematical analysis and optimization in connection to their use in business informatics and economics.

	Knowledge and understanding: • D1.1 - Possess basic knowledge of mathematical analysis, algebra, numerical calculation and optimisation methods which support computer science and advanced economics. Applying knowledge and understanding: • D2.1 - Ability to use mathematics and statistical data analysis tools to solve computational problems. Learning skills • D5.1 - Learning ability to undertake further studies with a high degree of autonomy.
Specific Educational Objectives and Learning Outcomes (additional info.)	
Assessment	The final exam consists of a written test (50%) and an oral test (50%). The written test (of 2 hours) contains questions and exercises on the material covered during the course. The oral test (of ca. 20 minutes) can involve both a discussion of the answers given in the written part, as well as unseen questions and short exercises based on the course topics. The aim of both the written and the oral tests is to check to which degree students have mastered the following learning outcomes: 1) acquiring knowledge and understanding; 2) applying knowledge and understanding.
Evaluation Criteria	Correctness and clarity of the answers.
Required Readings	• L. Peccati, S. Salsa, A. Squellati. Mathematics for Economics and Business. Bocconi University Press, 2017. Subject Librarian: David Gebhardi, David.Gebhardi@unibz.it
Supplementary Readings	• Michiel Bertsch, Roberta Dal Passo, Lorenzo Giacomelli. Analisi Matematica. MacGraw Hill, 2011 (in Italian). • M. Bramanti, C. Pagani, S. Salsa. Analisi Matematica 1. Zanichelli, 2008 (in Italian). • E. Lanconelli. Lezioni di Analisi Matematica 1. Pitagora,

	1994 (in Italian). • W. Rudin. Principles of Mathematical Analysis. McGraw-Hill, 1976 (3rd ed.).
Further Information	
Sustainable Development Goals (SDGs)	Quality education