Syllabus

Course description

Course title	Mathematical Analysis I
Course code	42442
Course title additional	
Scientific sector	MAT/05
Teaching language(s)	Italian
Degree course	Bachelor in Electronic and Information Engineering
Other degree courses (loaned)	
Lecturer(s)	Dr. Laura Levaggi, laura.levaggi@unibz.it https://www.unibz.it/en/faculties/engineering/academic-staff/person/27466
Teaching assistant(s)	
Semester	First semester
Course year	
CP	9
Teaching hours	60
Lab hours	30
Individual study	135
Planned office hours	27
Contents summary	• Complex numbers Definition, algebraic operations, trigonometric and exponential form, algebraic equations. • Real functions, limits and continuity in one variable Review of the properties of real numbers and the basic concepts on real functions of one real variable. Sequences and limits for sequences. Limits and continuity of functions. Infinite and infinitesimal functions: Landau symbols and rate

	of convergence. • Differential calculus of real valued functions in one variable. Tangent to a graph and first derivative. Rules of differentiation. Differentiability and singular points. Theorems of Rolle and Lagrange. Absolute and relative extrema. Higher-order derivatives. Qualitative study of a function. • Local comparison of functions and Taylor expansions in one variable. Taylor formulas. Expansions of elementary functions and algebraic techniques to determine Taylor polynomials. Local analysis and limits calculation using Taylor expansions. • Real sequences and numerical series. Convergence criteria for numerical real series. Fundamentals of Taylor series • Integral calculus of real valued functions in one variable. Antiderivatives and rules of indefinite integration for functions in one real variable. Definite and improper integrals.
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	algebraic techniques to determine Taylor polynomials. Local analysis and limits calculation using Taylor expansions. • Real sequences and numerical series. Convergence criteria for numerical real series. Fundamentals of Taylor series • Integral calculus of real valued functions in one variable. Antiderivatives and rules of indefinite integration for functions in one real variable. Definite and improper integrals.
Keywords	
Prerequisites	
Propaedeutic courses	
Teaching format	The course is made up of a series of frontal lectures, both devoted to the presentation of theoretical concepts and to their application in exercises. Topics will be presented on the blackboard and explanations will be supported by the use of software, both in analysing calculations and for the graphical visualization. The reference textbook for theory is cited in the bibliography. During the course lists of exercises will be made available to the students. Each of the activities carried out during the course's hours will be documented on the OLE web site.
Mandatory attendance	recommended
Specific educational objectives and learning outcomes	The course is part of basic didactic activities and in particular in the disciplinary sector "Mathematics, Informatics and Statistics". The course is compulsory. It is and introductory course, devoted to the basic notions of mathematical analysis, in particular of infinitesimal, differential and integral calculus for real functions of one real variable. The objective is not only to convey a set of notions and tools, but also to acquire a deeper understanding of the mathematical concepts from which they are derived. This is fundamental in order to be able to use learned techniques in a rational way and to apply them to other technical and scientific subjects.

	Intended Learning Outcomes (ILO) Knowledge and understanding 1. Knowledge of the fundamental concepts and basic tools of infinitesimal, differential and integral calculus for real functions of one real variable. Applying knowledge and understanding 2. Mastering of a methodology of non-mechanical, rational application of calculus techniques. Making judgements 3. Ability to evaluate the characteristics of the problem to be solved, set it in the correct theoretical framework and subsequently choose the most suitable method to get to its solution. Communication skills 4. Mastery of the use of the specific mathematical lexicon. Learning skills 5. Capability to a rational, analytical approach in handling problems
Specific educational objective and learning outcomes (additional information)	
Assessment	The final exam consists of: - a written examination, with exercises about the topics covered during the course, that aims at verifying the understanding of the theory and the ability in using the relevant calculus techniques; - the subsequent discussion of the corrected test.
Evaluation criteria	Il voto finale attribuito è unico. La prova scritta si compone di una prima parte di verifica del

	raggiungimento dei requisiti minimi di comprensione dei concetti e abilità nell'uso degli strumenti di calcolo necessari per il superamento dell'esame (ILO valutati 1-2) e di una seconda parte con esercizi in cui viene valutata la preparazione su vari argomenti, la capacità di associare diversi strumenti di calcolo e la visione d'insieme del problema proposto (ILO 3-5). In questa parte sono valutate la chiarezza nello schema di risoluzione e l'appropriatezza della metodologia scelta per risolvere i problemi (ILO 3-4) e la correttezza nell'applicazione delle tecniche di calcolo (ILO 1-2). Eventuali errori e/o omissioni segnalati nella correzione verranno poi discussi con lo studente.
	Valutazione formativa
	Forma: Esame scritto
	Lunghezza/Durata: Test a risposta breve con soglia di superamento del 60%
	ILO valutati: 1-2
	Valutazione sommativa
	Forma: Esame scritto + Discussione dello scritto (facoltativa) %: 95% per esame scritto + 5% per la discussione
	Lunghezza/Durata: 4 esercizi (120 minuti) per l'esame scritto + 5-10 minuti per la discussione
	ILO valutati: 1-5 x l'esame scritto + 4,5 per la discussione
Required readings	Textbook:
	C. Canuto, A. Tabacco "Analisi Matematica I", Springer Verlag Italia, 2014.

	(Print: ISBN: 88-470-5722-1 Online: [Ebook Springer](#)) An english version of the text is also available: C. Canuto, A. Tabacco, "Mathematical Analysis I", Springer International Publisher, 2015. (Print: ISBN: 978-3-319-12771-2 Online: [Springer Ebook](#))
Supplementary readings	Other bibliographic references for exercises or further study (available at the University library) may be suggested during the course, also in languages different from the official one. The student can refer to the web site of the course for any related information.
Further information	
Sustainable Development Goals (SDGs)	