Università degli Studi di L'Aquila - Dipartimento di Ingegneria e Scienze dell'Informazione e Matematica

Course catalogue

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Programme of Course "Analisi Matematica I"

- Code: I0195
- Type of course unit: Elective (Laurea in Ingegneria dell'Informazione curriculum Automatica)
- Level of course unit: Undergraduate Degrees
- Semester: 1

Number of ects credits: (Laurea in Ingegneria dell'Informazione) 9 (workload 225 hours)

Teachers: Klaus Engel (engel@ing.univaq.it)

1	**Course objectives**	To give students a rigorous understanding of the theory of real- and vector-valued functions. Students will acquire an understanding of basic properties of the field of real numbers, concepts of infinity, limits of functions and methods for calculating them, continuity, differentiation, integration and Taylor series.
2	**Course content and learning outcomes (dublin descriptors)**	Topics of the module include: • Set theory (basic notations and concepts), real numbers (basic properties, order, completeness), mathematical induction • Sequences and series (convergence, divergence and irregularity, convergence criteria) • Functions (injectivity, surjectivity, invertibility, composition) • Limits (basic definitions, the Sandwich Rule, boundedness) • Continuity (basic definitions, the Intermediate Value Theorem, numerical methods for solving equations) • Differentiation (basic definitions, rules and properties, Rolle's Theorem, the Mean Value Theorem), L'Hopital's Rule (techniques and applications), Taylor's Theorem (polynomial approximations to functions, convergence criteria for Taylor series) • Integration (basic properties, the Riemann definition, the Fundamental Theorem of Calculus, integration by parts and substitution, improper integrals) • Limits and continuity of functions of several real variables (basic techniques, polar coordinates) • Differentiation of real- and vector-valued functions of several real variables (partial derivatives, gradient, differential, Jacobi matrix) • Integration of real functions of several real variables (simple domains, Fubini-Tonelli's Theorem, integration by substitution) On successful completion of this module, the student should : • have a good knowledge and understanding of basic properties of real numbers, functions; demonstrate an understanding of basic topics in the analysis of functions, including limits, continuity, differentiation, Taylor-MacLaurin series, and integration; • be able to apply his knowledge and understanding to tackle basic problems from applied mathematics and engineering; understand formal mathematical definitions and theorems, and apply them to prove statements about functions; • demonstrate skills in mathematical reasoning and ability to conceive a proof; • be able to explain the main notions and results of mathematical analysis; • demonstrate capacity to read and understand advanced texts.
3	**Course prerequisites**	Basic mathematical notions and methods as learnt at high school
4	**Teaching methodsand language**	Lectures and exercise classes **Language**: Italian **Reference textbooks** • Klaus Engel, ***Appunti del Corso di Analisi Matematica***. *http://people.disim.univaq.it/~klaus.engel/ana1.pdf* • A.Marson, P.Baiti, F.Ancona, B.Rubino, ***Corso di Analisi Matematica 1***. Carocci. • P.Marcellini, C.Sbordone, ***Esercitazioni di Matematica***. Carocci. • S.Salsa, A.Squellati, ***Esercizi di Matematica***. Zanichelli. • M.Bramanti, C.D.Pagani, S.Salsa, ***Matematica***. Zanichelli.

5	**Assessment methods**	Written and oral exam