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 II"

- Code: I0201
- Type of course unit: Compulsory (Laurea in Ingegneria dell'Informazione curriculum Comune)
- Level of course unit: Undergraduate Degrees
- Semester: 1

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

Teachers: Rosella Colomba Sampalmieri

1	**Course objectives**	TO ACQUIRE AND BE ABLE TO APPLY, IN THE VARIOUS FIELDS OF ENGINEERING, THE CONCEPTS AND THE COMPUTATIONAL TECHNIQUES OF THE NOTIONS INTRODUCED IN THE COURSE. IN PARTICULAR TO HAVE KNOWLEDGE AND UNDERSTANDING OF THE CONCEPT OF SOLUTION (EXISTENCE AND UNIQUENESS) OF AN ORDINARY DIFFERENTIAL EQUATION, OF CONSERVATIVE VECTOR FIELDS, OF CONVERGENCE OF A SEQUENCE OR OF A SERIES OF FUNCTIONS
2	**Course content and learning outcomes (dublin descriptors)**	Topics of the module include: • Taylor approximation of functions of several variables. Implicit functions. Dini's theorem. Implicit function theorem in more than two variables. Non-linear systems of m equations in n unknowns. Taylor approximation to the function defined implicitly. • Elements of vector analysis . Reminders on scalar and vector product and their properties. Curves in space. Main definitions . Physical examples . Plane curves . Regular curves. Rectifiable curves . Length of a curve . Curvilinear abscissa . Normal and binormal vectors . Curvilinear integrals . Surfaces in space . Main definitions . Smooth surfaces . Examples from elementary geometry . Edge of a surface. Normal vector . Tangent plane. Orientation . Area of ??a surface . Surface integrals . Vector fields . Definition of the vector field . Irrotational and conservative vector fields . Potential. Simply connected domains . Flow of a vector field . Divergence and curl operators . Stokes' theorem in space. The Gauss' thorem in space. Intrinsic definition of the rotor and divergence. Multiple integrals . The theorems of Stokes , Gauss and Gauss-Green in IR^2. • Opimization • Complex numbers. Modulus, argument, conjugate. Algebraic, trigonometric, exponential form. N-th roots of a complex number. Fundamental Theorem of Algebra: real and complex case. • Cauchy problem. General equations of the 1st order. 1st order differential equations with separable variables. Linear differential equations of the 1st order. General structure of the integral of a linear differential equation of order n. Linear differential equations of higher order with constant coefficients. Outline of boundary value problems for ordinary differential equations. • Sequences and series of functions. Pointwise and uniform convergence of a sequence. Pointwise convergence, absolute, uniform and total for a series of function. Power series. Fourier series. Complete orthonormal systems in Hilbert spaces. Space of square-integrable functions. Trigonometric polynomials. Fourier series. Main convergence results. On successful completion of this module, the student should : • HAVE KNOWLEDGE AND UNDERSTANDING OF THE CONCEPT OF SOLUTION (EXISTENCE AND UNIQUENESS) OF AN ORDINARY DIFFERENTIAL EQUATION, OF CONSERVATIVE VECTOR FIELDS, OF OPTIMIZATION, OF CONVERGENCE OF A SEQUENCE OR OF A SERIES OF FUNCTIONS AND TO INCREASE THE BACKGROUND OF MATHEMATICAL TOOLS NECESARY TO DEAL WITH PROBLEMS FROM THE APPLIED SCIENCES • TO ACQUIRE AND BE ABLE TO APPLY, IN THE VARIOUS FIELDS OF

		ENGINEERING, THE CONCEPTS AND THE COMPUTATIONAL TECHNIQUES OF THE NOTIONS INTRODUCED IN THE COURSE • SHOULD DEMOSTRATE SKILL IN MATHEMATICAL REASONING AND ABILITY TO CONCEIVE AN AUTONOUMUS SOLUTION OF A PROBLEM • TO BE ABLE TO PRESENT THE SOLUTION OF A TECHNICAL PROBLEM BY MEANS OF CORRECT MATHEMATICAL LANGUAGE AND NOTATIONS • STUDENT SHOULD BE ABLE TO TO READ AND UNDERSTAND TECHNICAL BOOKS WHICH USE AN ADVANCED MATHEMATICAL LANGUAGE
3	**Course prerequisites**	ALL THE NOTIONS AND TECHNIQUES OF THE FIRST COURSE IN MATHEMATICAL ANALYSIS AND MANY BASIC CONCEPTS FROM GEOMETRY, SUCH AS VECTOR FIELDS, MATRICES, ETC.
4	**Teaching methodsand language**	LECTURES AND EXERCISE CLASSES **Language**: Italian **Reference textbooks** • C. Lattanzio, B. Rubino, ***Analisi Matematica III: appunti per gli studenti della Facoltà di Ingegneria***. 2005. *http://www.mathmods.eu/resources/downloads/viewcategory/17-appunti* • B. Rubino, ***Equazioni differenziali, teoria ed esercizi, versione preliminare 2004***. 2004. *http://www.mathmods.eu/resources/downloads/viewcategory/17-appunti* • C.D. PAGANI-S.SALSA, ***ANALISI MATEMATICA 2***. ZANICHELLI. (vol. secondo) 1995. • P. Marcellini-C.Sbordone, ***Esercitazioni di matematica***. Liguori. (vol. secondo, parte prima e seconda) 1994. • S.Salsa-A.Squellati, ***Esercizi di Analisi Matematica 2***. Zanichelli. (vol. 1, 2, 3) 1994.
5	**Assessment methods**	WRITTEN AND ORAL EXAMINATION