Nicoletta Cancrini

Programme of "Mathematical Analysis 2"		
Number of ECTS credits: 9 (workload is 225 hours; 1 credit = 25 hours)		
I0201, Compulsory **1st Cycle in Industrial Engineering, 1st year , 2nd semester** Teacher: **Nicoletta Cancrini**		
1	**Course objectives and Learning outcomes**	The goal of this course is to give the students the elements and techniques essential to th understanding, analysis and construction of mathematical models useful to engineering.
2	**Dublin descriptors**	Topics of the module include: **Ordinary differential equations II.** Second order linear equations , first order systems of two equations. **Numerical series.** Series with non negative terms and convergence criteria. Variable sign series. **Power series and Fourier series.** Functions series and total convergence. Power series and Taylor series. Trigonometric series and Fourier series. Fourier coefficients and series of a function. Mean quadratic approximation. Punctual convergence of a Fourier series. Some physical interpretation. **Differential calculus for real functions of several variables.** Graphs and level sets. Limits and continuity for functions of several variables. Partial derivatives, tangent plane, differential. Derivatives of higher order differential second, Hessian matrix, Taylor's formula to second order. Stationary points, free ends, testing of the Hessian matrix. Extreme bound. Method of Lagrange multipliers. **Multiple Integral .**Double integrals on simple domains for continuous functions, properties in elementary, method of reduction and change of variables. Triple integrals. Polar coordinates in space and cylindrical coordinates. Applications: volumes, centers of gravity and moments of inertia. **Vector fields.** Vector fields and line integrals of the second kind: field lines, gradient, curl, divergence, line integral of a vector field, work and circling, conservative fields and potential, irrotational fields. Gauss-Green formula in the plan. Surface integral of a vector field. Flow. Divergence theorem. Theorem of the rotor. On successful completion of this module the student should - have profound **knowledge** of basic techniques in Mathematical Analysis, - have **knowledge and understanding** of analysis arguments, - **understand and explain** the meaning of complex statements using mathematical notation and language; - **understand** the fundamental concepts of ordinary differential equations, numerical and functions series, differential calculus for functions of several variable, multiple integral, vector fields and their connections, and be aware of potential applications in other fields, - **demonstrate skill** in mathematical reasoning and **ability** to solve exercises, - demonstrate **capacity** for reading and understand other texts on related topics.
3	**Prerequisites and learning activities**	The student must know the basic notions of Mathematical Analysis and Geometry contained in the exams of Analysis 1 and Geometry.
4	**Teaching methods and language**	Lectures and exercises. Language: Italian **Ref. Text books**

		M. Bramanti,C.D.Pagani,S.Salsa, Analisi Matematica 1, Zanichelli. M.Bramanti,C.D.Pagani,S.Salsa, Analisi Matematica 2, Zanichelli. S. Salsa, A. Squellati, Esercizi di Analisi Matematica 1, Zanichelli. S. Salsa, A. Squellati, Esercizi di Analisi Matematica 2, Zanichelli. M. Bramanti, Esercitazioni di Analisi Matematica 2, Esculapio.
5	**Assessment methods**	Written and oral exam.