



UNIVERSITA' DEGLI STUDI MEDITERRANEA DI REGGIO CALABRIA
Dipartimento di Giurisprudenza ed Economia
Comparto didattica

A): GENERAL INFORMATION:

- **Degree Course:** SCIENZE ECONOMICHE
- **Course name:** Mathematical Economics
- **Professor:** Prof. Massimiliano Ferrara
- **Other Professors:** _____
- **Scientific disciplinary sector:** SECS/S06
- **University credits – ECTS:** 8
- **Teaching hours:** 48
- **Course year:** a.a. 2013/2014
- **Semester/year:** I semester

B) SPECIFIC INFORMATION:

- **Syntetic description of course:** Today the study of Mathematics in Economic Courses assumes a fundamental importance. A future economist and / or qualified financial operator should have knowledge of quantitative methods and analytical tools in order to analyze real socio-economic events. The aim of course is to provide the mathematical tools needed to study economic and financial models.
- **Course entry requirements:** *Elementary Algebra:* Algebraic, logarithmic, exponential and radical equations and disequalities. Graphic solution of equations.
Analytic geometry
- **Expected learning results:** At the end of the course the student is familiar with the mathematics foundations, in particular with basic linear algebra, fundamentals of functions and one and more variables differential calculus.
- **Course programme:** *Matrix and vector algebra. Linear models:* Introductory matrix theory and operations with matrixes. Sarrus and Laplace rules for the determinant computation of square matrixes. Properties of the determinant. Invertible matrix, necessary and sufficient conditions for invertibility. Inverse matrix and rank. Eigenvalues and eigenvectors of a square matrix. Systems of linear equations: Cramer and Rouchè-Capelli theorems. Homogeneous systems. Solutions of systems depending on a parameter.

Sequences: Sequences. Monotone sequences. Limit of a sequence. Convergence of a sequence.



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Real function: Real functions of one real variable: properties, composition, inverse. Increasing and decreasing functions. Polynomial, logarithmic, exponential, rational and radical functions.

Definition of limit. Fundamental theorems on limits. Operations with limits. Indeterminate forms. The "Euler number".

Continuous functions. Theorem of existence of zeros. Intermediate value theorem. Weierstrass Theorem. Inverse function, monotonicity and continuity.

Derivatives: properties and rules. Geometric meaning of the first derivative.

Rolle, Lagrange, Cauchy theorems. Corollaries of Lagrange's theorem: test of monotony, characterization of constant functions, limit theorem of the derivative. Theorem of De l'Hospital.

Higher order derivatives. Finding Points of maximum and minimum absolute and relative. Fermat's Theorem (a necessary condition for the existence of points of minimum and maximum relative). Sufficient conditions for the existence of points of minimum and maximum relative. Concavity, convexity. Inflection points. Study of the graph of a function.

Functions of several variables and application models: General information on functions of several variables. Domain, contours, limits and continuity. Global and local extrema. Differential Calculus with applications.

Maxima and Minima: definitions. Limits and differentiability. Composite functions and their differentiation.

Unconstrained optimization: free local maxima and minima. Necessary conditions for interiors. Sufficient conditions for interiors.

Integral Calculus: Integral Calculus: Riemann integral, the fundamental theorem of integral calculus, primitive of elementary functions, integration by parts and by substitution, integral generalized.

- **Verification system of learning results:** Written test and oral exam.
- **Description of verification system of learning results:** The written test can consist of two partial written tests during the year (for frequent students), valid for the final exam (written).

The oral exam can be of two types:

- A. A discussion of the written test during which the candidate can look at his own elaborate and must be able to justify the results obtained showing also the fundamental knowledge



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of the basic functions of a real variable and the differential calculus. By supporting this type of interview it is only possible to confirm the grade of the written test.

- B.** A complete oral exam in which the candidate must show to know the main results and their applications.

- **Suggested texts**

For Basic Elements:

M.Fini, G. Insardà, D. La Torre: “Matematica di Base”. UTET, Milano, 2005.

Istitutional course:

- F. Privileggi: “Compendio di Matematica per l’economia”. Ed. Simone, Napoli, 2007.

or:

- M.E. De Giuli, G.Giorgi, M.Maggi, U. Magnani: “Matematica per l’economia e la finanza”, Zanichelli Editore, Bologna, 2008.
- L. Peccati, S. Salsa, A. Squellati: "Matematica per l'Economia e l'Azienda", Ed. Egea, Milano, 2002. Capitoli : 1-2-3-4-5-6-7-8-9-10-12.
- C. P. Simon, L. Blume: Matematica generale, Egea, Milano