UNIVERSITÀ DEGLI STUDI DI PALERMO

DEPARTMENT	Scienze Economiche, Aziendali e Statistiche
ACADEMIC YEAR	2023/2024
BACHELOR'S DEGREE (BSC)	ECONOMICS AND FINANCE
SUBJECT	GENERAL MATHEMATICS
TYPE OF EDUCATIONAL ACTIVITY	A
AMBIT	50178-Statistico-matematico
CODE	04897
SCIENTIFIC SECTOR(S)	SECS-S/06
HEAD PROFESSOR(S)	LACAGNINA VALERIO Professore Associato Univ. di PALERMO
OTHER PROFESSOR(S)	
CREDITS	9
INDIVIDUAL STUDY (Hrs)	145
COURSE ACTIVITY (Hrs)	80
PROPAEDEUTICAL SUBJECTS	
MUTUALIZATION	
YEAR	1
TERM (SEMESTER)	1° semester
ATTENDANCE	Not mandatory
EVALUATION	Out of 30
TEACHER OFFICE HOURS	**LACAGNINA VALERIO** Monday 10:00 12:00 Stanza 113, piano primo, Dipartimento SEAS.

DOCENTE: Prof. VALERIO LACAGNINA- *Matricole DISPARI, - Matricole PARI*

PREREQUISITES	Elementary equations and inequalities: linear, quadratic and higher grade. Logarithmic and exponential equations and inequalities. Irrational equations and inequalities. Fractional equations and inequalities. Absolute value and its properties. Notions of Trigonometry: radian system, sine, cosine and tangent.
LEARNING OUTCOMES	Knowledge and understanding: acquisition of functional calculus, limits calculus, differential and integral calculus for real functions of a real variable, linear algebra elements, power series. Applying knowledge and understanding: ability to handle mathematical formalism: from a real operating environment to a theoretical framework in which variables are used to solve problems and to model real situations. Ability to use abstract concepts and models for concrete situations. Making judgements: being able to assess the potential and the limits of the available analytical tools to the applied disciplines. Communication: being able to relate topics addressed by using logical and formal languages correctly. Lifelong learning skills: developing the learning capacities needed to undertake advanced studies with a high degree of autonomy.
ASSESSMENT METHODS	Multiple choice test followed by a short oral discussion. Each question has five possible answers: only one gives 1 point, two give 0 points, one gives -0.25 points, one gives -0.5 points (in order to discourage the random answer) and finally the question not answered or with two or more answers gives 0 points. The written exam can be passed in one of the two possible ways: 1) (Recommended) Two partial written exams: intermediate exam in November and final exam in one of the general sessions scheduled for the academic year. The first part consists of 6 questions, it weighs one third of the final vote, and it lasts 40 minutes. The second and final part consists of 8 questions, it weighs two thirds of the final vote, and it lasts 50 minutes. In the first test to obtain 18/30 you need to get at least 2/6 points. In the second test to obtain 18/30 you need to get at least 3/8 points. The final grade is the weighted average of the (rounded) marks obtained in the two tests. 2) A unique exam containing 14 multiple choice questions in one of the general sessions scheduled for the academic year. This modality is intended for students who have withdrawn from the two-stage procedure or haven't passed the intermediate test with the minimum value of 17/30. The test lasts 1 hour and 30 minutes. To get 18/30 you need to get at least 5/14. I must point out that in the two-stage test the total weight of the test is: 1/3 x 2/6 + 2/3 x 3/8 = 0.361 while, in the case of the single test, the value of the test is: 5/14 = 0.357 that is, it is slightly more convenient to choose the two partial written exams. In both the two procedures, questions have been designed to test learning and logical / deductive abilities on all the topics of the course. Students can optionally perform a corrective oral exam on the theory (theorems with demonstrations). This oral discussion allows a maximum improvement of two points, but also implies the possibility of lowering the mark (also coming to rejection if the oral test is insufficient).
EDUCATIONAL OBJECTIVES	The lectures continue, make uniform, and extend the knowledge acquired in under graduate studies. The primary goal is developing the ability to critically examine the mathematical concepts already acquired. The second goal is the acquisition of more advanced mathematical methods and oriented toward understanding and the use of formal descriptions to model economic and social. processes.
TEACHING METHODS	Face-to-face lectures: 56 hours. In-class exercises: 24 hours.
SUGGESTED BIBLIOGRAPHY	Tutti gli argomenti vengono trattati in: • Dispense fornite dal docente su tutti gli argomenti trattati al sito: https:// sites.unipa.it/valerio.lacagnina/ • Salvatore Greco, Benedetto Matarazzo, Salvatore Milici, Matematica generale, Giappichelli Editore, Torino. • Gianni Ricci, Matematica Generale, McGraw-Hill. • Ferrarotti, Appunti di Algebra Lineare, disponibile on-line Per gli argomenti di base: • Antonio Pecorella, Maria Conigliaro, Valerio Lacagnina, Precorso di Matematica Generale, Pearson Editore. Per gli approfondimenti o uno studio più avanzato si consigliano i testi (facoltativi): • Angelo Guerraggio, Matematica 3/Ed. con MyLab e eText • Cristina Di Bari, Pasquale Vetro, Analisi matematica con elementi di calcolo numerico, Vol 1 e 2, Libreria Dante Palermo (disponibili in biblioteca di Dipartimento)

	Per le esercitazioni si consiglia il testo: • P. Marcellini, C. Sbordone, Esercitazioni di Matematica, Vol. I e II, Liguori Editore.

SYLLABUS

Hrs	Frontal teaching
1	Presentation and course objectives.
4	Set theory: numerical sets, hints on complex numbers set, set operations, set of parts of a set, cartesian product, partition of a set, algebra of sets, relations and elementary functions, mathematical logic.
6	R^2 topology: neighbourhood of a point, union and intersection of neighbourhoods of a point, interior points, exterior points, isolated points, limit point, boundary of a set, open set, closed set, convex set, intervals.
4	Real valued functions: representation of a function, odd and even functions, periodic functions, bounded function, unbounded function, lower and upper bound of a function, maximum and minimum of a function, monotone functions, inverse function, absolute value functions, rational functions, irrational functions, exponential functions, logarithmic functions, trigonometric functions, convex functions.
6	Limits of a function: definition, theorems, computation theorems, left and right limits, limits of monotone functions, notable special limits.
1	Continuous functions: definition, singularity points, continuity theorems, composition of continuous functions, continuous functions defined on a compact set or interval, continuity of inverse functions.
7	Differential calculus: definition of derivative of a function, derivatives of elementary functions, relationship between derivability and continuity, derivative of composite functions, derivative of inverse functions, derivative of a sum of function, derivative of a product of functions, derivative of the quotient of a function, derivative of the absolute value of a function, derivative of a logarithmic function, derivative of a function raised to another function, geometric meaning of the derivative, right and left derivative, inflection points, higher derivatives, differentiability of a function, higher differentials, local slope of a function, relative maximum and minimum, theorems of Rolle, Cauchy and Lagrange, large growth, De L'Hospital rule, convex functions, asymptotes.
6	Integral calculus: definition, properties, fundamental theorem of integral calculus, calculating integral: direct integration, integration by parts, integration by change of variable, improper integral.
10	Power Series: sequences, series, sequences of functional values, convergence criterias, power series, Taylor and Mac Laurin series, Taylor and Mac Laurin polynomials.
7	Matrices: definition, sum of matrices, scalar multiplication, matrix multiplication, transposition of a matrix, linear combination of matrices, square matrix, triangular matrices, diagonal matrices, scalar matrix, determinant of a square matrix, determinants properties, minor of a matrix, Laplace theorems, property of determinants, adjugate matrix, rank of a matrix.
4	Systems of linear equations: definition, Gauss reduction, row reduction, pivot and free variables, geometric interpretation, homogeneous systems, Cramer theorem, Rouche-Capelli theorem.

Hrs	Practice
24	In-class exercises on all subjects of face to face lecturers: 2 hrs for basic subjects, 3 hrs for limits and continuity, 3 hrs for differential calculus, 2 hrs for function study, 4 hrs for integral calculus, 4 hrs for power series, 2 hrs for matrices and linear equations systems, 4 hrs for preparation to intermediate and final exam.