UNIVERSITÀ DEGLI STUDI DI PALERMO

DEPARTMENT	Scienze Economiche, Aziendali e Statistiche
ACADEMIC YEAR	2019/2020
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)	149
COURSE ACTIVITY (Hrs)	76
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

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	A written "seen exam" followed by a brief oral discussion. The written exam can be passed in one of the two possible ways: 1) (Recommended) Two partial written exams: intermediate at November, and final exam in one of the general sessions scheduled in the academic year. The first part consists of 5 open-ended questions and it weighs half the final vote. The second and final written exam consists of 5 open-ended questions and it weighs half the final vote. In each of the two partial written tests each question weighs at most 6 points. Questions are to be answered in a time-constrained of one hour and fifteen minutes. In case of errors, a single question may vary in the interval [0, 6], depending on the number and type of errors. 2) A unique exam containing 10 open-ended questions covering the entire syllabus, in one of the general sessions scheduled in the academic year. This last way is mainly meant for students who have withdrawn from the two stages procedure or did not pass the intermediate test with the minimum value of 17/30. Each question weighs at most 3/30 points. Questions are to be answered in a time-constrained of two hours and fifteen minutes. In case of errors, the evaluation of a single question may vary within the range [0, 3], depending on the number and type of errors. To facilitate the students who use this second way, in case of insufficiency of the wirtten open-ended test, the two parts in which the task is composed are evaluated separately. If one of the two (5 questions of 6 points) is sufficient, the student re-enters in mode 1 and therefore only has to perform the remainung part in which he was insufficient. In both the described ways, 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 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, makes uniform, and extend the knowledge acquired in pre-university 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: 20 hours.
SUGGESTED BIBLIOGRAPHY	Tutti gli argomenti vengono trattati in: • Dispense fornite dal docente su tutti gli argomenti trattati, reperibili sul sito www1.unipa.it/valerio.lacagnina • Salvatore Greco, Benedetto Matarazzo, Salvatore Milici, Matematica generale, Giappichelli Editore, Torino. • Ferrarotti, Appunti di Algebra Lineare, disponibile on-line Per un'introduzione piu' leggera e argomenti di base: • Gianni Ricci, Matematica Generale, McGraw-Hill. • Salvatore Modica, Salvatore Piraino, Disequazioni e grafici per l'analisi matematica, Liguori Editore. Per gli approfondimenti si consigliano i testi (facoltativi): • Cristina Di Bari, Pasquale Vetro, Analisi matematica con elementi di calcolo numerico, Vol 1 e 2, Libreria Dante Palermo (disponibili in biblioteca di Dipartimento) • Giorgio Giorgi, Elementi di matematica, Giappichelli Editore. 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
20	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.