

General information	
Academic subject	Applied Mathematics for Economics and finance
Degree course	Economics and business administration
Academic Year	1
European Credit Transfer and Accumulation System (ECTS)	8
Language	Italian
Academic calendar (starting and ending date)	15 September - 23 December
Attendance	No

Professor/ Lecturer	
Name and Surname	Lucianna Cananà
E-mail	lucianna.canana@uniba.it
Telephone	
Department and address	Ionic Department in "Legal and Economic Systems of the Mediterranean: society, environment, culture"
Virtual headquarters	
Tutoring (time and day)	Tuesday, 09:00-11:00, in attendance

Syllabus	
Learning Objectives	
Course prerequisites	Basic knowledge of algebra and analytical geometry
Contents	<p>Elements of set theory. Logical symbols. Notion of equality and inclusion. Set of parts of a set. Union, intersection, difference and complement operation. De Morgan formulas. Covering and partitioning of a whole. Cartesian product. Functions. Direct image. Reciprocal image. Injective, surjective, invertible functions. Restriction and extension of a function. Compound functions.</p> <p>Numeric sets. The set of natural, rational and real numbers. Intervals. Absolute value. Minor and major, upper and lower extremity, maximum and minimum of a subset of \mathbb{R}. Characteristic property of the upper/lower extremity. Separate sets. Separator element. Contiguous sets. Countable sets. Completeness properties of \mathbb{R}. Power of a number. Root nth. Logarithms and their properties. Open and closed sets. Accumulation points.</p> <p>The space \mathbb{R}^n. Concept of distance on \mathbb{R}^n. Scalar product. Standard of a carrier. Around a point. Open and closed sets. Accumulation points.</p> <p>Real functions of real variable. Cartesian representation. Symmetries (parity, disparity, periodicity). Monotony. Global and local maxima and minima of a function. Convexity and inflection points. Elementary functions.</p> <p>The notion of limit for functions. The notion of limit. Uniqueness of the limit. Limit from right and left. Operations with limits. Indeterminate</p>

	<p>forms. Theorem on the permanence of the sign. Forced convergence theorem. Remarkable limits. Theorem on the limit of monotone functions.</p> <p>Succession. Limit of successions. Nepero's number</p> <p>Differential calculus. Concept of derivative. Geometric meaning of the derivative. "Economic" meanings of the derivative. Angular and cuspidal points. Operations with derivable functions. Higher order derivatives. Derivatives of elementary functions. Elasticity of a function. Taylor formula and applications. Necessary conditions for the existence of relative maxima and minima (Fermat's theorem). Sufficient conditions for the existence of relative extremes. Convex functions.</p> <p>Real functions of several real variables. Partial derivability. Partial derivatives of higher order. Schwarz's theorem. Differentiability and differential. Directional derivatives. Gradient. Hessian matrix. Taylor formula. Necessary conditions for the existence of relative maxima and minima (Fermat's theorem). Sufficient conditions for the existence of relative maximums and minimums. Functions implicitly defined. Dini's theorem. Maximum and minimum constraints. The Lagrange multiplier method.</p> <p>Applications to the economy. Unconstrained optimization in economics. Cobb-Douglas production functions. Homogeneous functions. Returns to scale. Marginal replacement rate. Constrained optimization in economics. The consumer problem.</p> <p>Applications to the finance: The time value of money. Discounting. The Internal Rate of Return (IRR). The bond market. Valuing bonds. The term structure of interest rates. Forward rates. Interest rate risk. Perpetuities and Annuities. Amortizing loans. The stock market. Valuing projects. The Net Present Value (NPV) decision rule. Interest Rate Bond.</p> <p>The indefinite integration. Primitive and indefinite integral. Integration by parts. Integration by replacement. Integration according to Riemann.</p> <p>Integral defined according to Riemann. Geometric interpretation of the integral. Existence theorem of primitives. Fundamental theorem of integral calculus. Average theorem. Calculation of areas.</p>
<p>Books and bibliography</p>	<p>Bertsch M., Dal Passo R., Giacomelli L., Analisi matematica 2/ed, McGraw Hill.</p>

	<p>Torriero A., Scovenna M., Scaglianti L. Manuale di Matematica. Metodi e Applicazioni - CEDAM – Padova.</p> <p>Sydsaeter K., Hammond P., Strom A., Metodi matematici per l'analisi economica e finanziaria, Pearson ed.</p> <p>Castellani G., De Felice M., Moriconi F., Manuale di finanza I, II Mulino, 2005.</p> <p>C. Mari, Appunti di Matematica Finanziaria (scaricabile dalla piattaforma e-learning dell'Università).</p>
Additional materials	

Work schedule			
Total	Lectures	Hands on (Laboratory, working groups, seminars, field trips)	Out-of-class study hours/ Self-study hours
Hours			
200 (8x25)	64	30	106
ECTS			
8			
Teaching strategy			
Expected learning outcomes			
Knowledge and understanding on:	<p>At the end of the teaching activities, the student must know and understand the mathematical tools illustrated during the course. The students must know the concepts of:</p> <ul style="list-style-type: none"> ○ Differential equation ○ Integral calculus ○ Financial tools ○ Economic tools 		
Applying knowledge and understanding on:	<p>At the end of the teaching activities, the student must be able to apply the quantitative techniques learned to the solution of economic and financial problems.</p> <ul style="list-style-type: none"> ○ financial phenomena ○ financial market ○ economic phenomena 		
Soft skills	<ul style="list-style-type: none"> • <i>Making informed judgments and choices</i> At the end of the teaching activities, the student must be able to acquire independent assessments in the formulation and modeling of economic and financial problems. • <i>Communicating knowledge and understanding</i> At the end of the teaching activities, the student must acquire and use the technical language typical of mathematics to solve <ul style="list-style-type: none"> ○ financial problems 		

	<ul style="list-style-type: none"> ○ economic problems. • <i>Capacities to continue learning</i> <p>At the end of the teaching activities, the student must be able to acquire independent assessments in the formulation and modeling of economic and financial problems.</p>
--	--

Assessment and feedback	
Methods of assessment	Written test - oral test
Evaluation criteria	<p>The course is in line with the general objective of the course of study to provide economic skills and mathematical-financial techniques for an adequate understanding of the economic system and the functioning of financial markets.</p> <p>The course, in particular, aims at equipping students with the technical tools necessary for understanding financial phenomena.</p> <p>To learn the basic concepts and tools of modern finance;</p> <p>To know how to formulate and solve basic problems of modern finance.</p>
Criteria for assessment and attribution of the final mark	<p>Written test - oral test: the written test, consisting of open-ended questions and the oral test, are designed to identify the knowledge acquired in the resolution of exercises and knowledge of abstract theoretical notions and applied to economics and finance. In addition, the examination test ascertains the ability to acquire the specific language of the discipline, the ability to synthesize and communicate.</p>
Additional information	lucianna.canana@uniba.it