General Information	
Academic subject	Applied Mathematics for Economics and finance
Degree course	Economics and business administration
Curriculum	
ECTS credits	8
Compulsory attendance	No
Language	Italian

Subject teacher	Name Surname	Mail address	SSD
	Lucianna Cananà	Lucianna.canana@uniba.it	SECS-S/06

ECTS credits details	Area		CFU/ETCS
Basic teaching activities	13/D4		8

Class schedule	
Period	I semester
Year	I
Type of class	Lectures in attendance

Time management	
Hours	200 (8x25)
In-class study hours	64
Out-of-class study hours	136

Academic calendar	
Class begins	13 September 2021
Class ends	23 December 2021

Syllabus	
Prerequisites/requirements	Basic knowledge of algebra and analytical geometry
Expected learning outcomes	**Knowledge and understanding**. At the end of the teaching activities, the student must know and understand the mathematical tools illustrated during the course. In particular, the concepts of differential and integral calculus and linear algebra. **Ability to apply knowledge and understanding.** 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. **Making assessments**. 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. **Communication skills.** At the end of the teaching activities, the student must acquire and use the technical language typical of mathematics.

	Learning skills. At the end of the teaching activities, the student must be able to continue the study of the discipline and must be able to apply the tools learned to the study of the economic, mathematical and statistical subjects present in the course of study
Contents	**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. **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 R. Characteristic property of the upper/lower extremity. Separate sets. Separator element. Contiguous sets. Countable sets. Completeness properties of R. Power of a number. Root nth. Logarithms and their properties. Open and closed sets. Accumulation points. **The space R^ n**. Concept of distance on R^n. Scalar product. Standard of a carrier. Around a point. Open and closed sets. Accumulation points. **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. **The notion of limit for functions.** The notion of limit. Uniqueness of the limit. Limit from right and left. Operations with limits. Indeterminate forms. Theorem on the permanence of the sign. Forced convergence theorem. Remarkable limits. Theorem on the limit of monotone functions. **Succession.** Limit of successions. Nepero's number **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. **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. **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. **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.
Course program	
Bibliography	Bertsch M., Dal Passo R., Giacomelli L., Analisi matematica 2/ed, McGraw Hill. Torriero A., Scovenna M.,Scaglianti L. Manuale di Matematica. Metodi e Applicazioni - CEDAM – Padova. Sydsaeter K., Hammond P., Strom A., Metodi matematici per l'analisi economica e finanziaria, Pearson ed. Castellani G., De Felice M., Moriconi F., Manuale di finanza I, Il Mulino, 2005. C. Mari, Appunti di Matematica Finanziaria (scaricabile dalla piattaforma e-learning dell'Università).
Notes	None
Teaching methods	Frontal lessons. Exercises.
Assessment methods	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.
Evaluation criteria	*Knowledge and understanding* 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. *Applying knowledge and understanding* The course, in particular, aims at equipping students with the technical tools necessary for understanding financial phenomena. *Autonomy of judgment* To learn the basic concepts and tools of modern finance; To know how to formulate and solve basic problems of modern finance. *Communicating knowledge and understanding / Capacities to continue learning* The student is expected to assimilate the fundamental notions of understanding the functioning of financial markets and of analyzing economic-financial phenomena; to adequately know the main economic and financial phenomena; to be able to correctly set and solve basic problems of modern finance; to be able to communicate effectively on economic and financial issues, using an appropriate technical language.
Further information	Lucianna.canana@uniba.it