COURSE OF STUDY Business Economics and Statistical Sciences
ACADEMIC YEAR *2023-2024*
ACADEMIC SUBJECT Financial mathematics

General information	
Year of the course	*Second year*
Academic calendar (starting and ending date)	*First semester (11/09/2023-16/12/2023)*
Credits (CFU/ETCS):	6
SSD	*SECS-S/06*
Language	*Italian*
Mode of attendance	*Optional*

Professor/ Lecturer	
Name and Surname	Giovanni Villani
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Telephone	
Department and address	*Department of Economics and Finance*
Virtual room	***TEAMS x35m79h***
Office Hours (and modalities: e.g., by appointment, on line, etc.)	Monday at 15.00 using TEAMS (on line)

Work schedule			
Hours			
Total	Lectures	Hands-on (laboratory, workshops, working groups, seminars, field trips)	Out-of-class study hours/ Self-study hours
150	*42*		*108*
CFU/ETCS			
6	*6*		

Learning Objectives	*The course aims to provide the basic knowledge necessary for the understanding of functioning of elementary and complex financial operations, of activities and projects of an economic-financial nature. For elementary financial operations, the basic definitions of interest and discount rates, amount, current value and the properties and financial regimes will be provided. In the context of complex financial transactions, the course aims to provide the skills necessary for the evaluation of financial income in a certain context, to understand the various methods of repayment of a loan and the evaluation of the convenience of a business project. Furthermore, the course aims to explain the relationships between interest rates and the quotations of bonds and finally the dynamics of a portfolio made up of shares.*
Course prerequisites	*Basic notions of mathematical analysis (differential and integral calculus) and linear algebra (vectors and matrices). Basic notions of economics and business economics.*

Teaching strategie	*Lectures and exercises related to the topics covered in class. At the end of each CFU, the exercises will consist in carrying out the exams of the previous sessions.*

Expected learning outcomes in terms of	
Knowledge and understanding on:	*The course aims to provide the student with the notions and analytical tools useful for understanding the functioning of financial markets and for the analysis of economic-financial phenomena.*
Applying knowledge and understanding on:	*The student must be able to interpret the main economic and financial phenomena. In particular, he must be able to build simple models to formulate and solve basic problems of modern finance on all the topics covered in the course program*
Soft skills	• *Making informed judgments and choices* The student must know how to autonomously evaluate the necessary information, conduct surveys and set up quantitative analyzes of the financial phenomena of the modern finance. • *Communicating knowledge and understanding* The student must be able to communicate effectively on economic and financial matters, using appropriate technical language. Theremultidisciplinary economic-financial and mathematical-statistical communication skills is, from this point of view, the main result of teaching • *Capacities to continue learning* The student must be able to face the subsequent teachings with a significant analytical capacity and with a quantitative investigation method well founded.
Syllabus	**FIRST CFU** Fundamental definitions: Interest and amount. Discount and present value. Relationship between fundamental financial quantities. The main financial regimes: Simple interest (and rational discounting). Compound interest (and discount). Equivalent rates. The nominal rate of interest. The instant rate. Theory of financial laws: Severability. **SECOND CFU** Certain annuities: First definitions. Temporary and perpetual constant annuities. Present value and amount of an immediate, deferred, temporary, unitary annuity. Loan amortization: The repayment schedule. The residual debt as the present value of the annuities still to be paid. French amortization. Italian amortization. American amortization. **THIRD CFU** The evaluation of certain financial transactions: The criterion of R.E.A. The criterion of T.I.R. The T.A.E.G. and the T.A.N. The course of bonds: General information on bond loans. **FOURTH CFU** The term structure of interest rates: Relationship between forward rates and interest rates spot. The absence of arbitrage opportunities. **FIFTH CFU** The average financial duration. The average financial duration as a measure of volatility. The convexity of a financial transaction. Principles of financial immunization.

	SIXTH CFU Portfolio theory: Risky and non-risky investments. The case of two titles.
Content knowledge	
Texts and readings	- *Fabrizio Cacciafesta, Matematica Finanziaria (classica e moderna) per i corsi triennali, Giappichelli Editore, Torino, 2013, ISBN 978•88•3488913•8* - *Dispense del docente;* - *David G. Luenberger, Introduzione alla Matematica Finanziaria, Maggioli Editore, 2015, ISBN 978-88-916-0995-3*
Notes, additional materials	*https://www.uniba.it/it/docenti/villani-giovanni*
Repository	

Assessment	
Assessment methods	*The exam in Financial Mathematics consists of a written and oral exam. The written test consists of SIX exercises. The written test is passed if a grade greater than or equal to 18/30 is obtained. Those who pass the written test will be able to access the oral test. As regards the oral exam, the student who passes the written exam with a grade between 18 and 21 will have to take the oral exam which consists of a series of questions (theoretical and/or exercises) on the entire program and the final grade may be increased maximum of TWO points compared to the WRITTEN.* *The student who passes the written test with a grade between 22 and 30 will be asked a preliminary question and in case of a positive outcome, he will be able to confirm the grade of the WRITTEN; however the student can choose to be subjected to further questions (theoretical and/or exercises) questioning the vote of the WRITTEN. Also in this case the final grade can be increased by a maximum of TWO points compared to the WRITTEN.*

Assessment criteria	• *Knowledge and understanding*
	  ○ The teaching has objectives in line with the general objective of the course of study of providing the economic, mathematical-statistical and legal skills for an adequate understanding of the economic system and the functioning of the financial markets
	• *Applying knowledge and understanding*
	  ○ The course, in particular, aims to provide students with the technical tools necessary for understanding financial phenomena
	• *Autonomy of judgment*
	Learn the fundamental concepts and tools of modern finance; know how to formulate and solve basic problems of modern finance.
	• *Communicating knowledge and understanding*
	  ○ The student must be able to face the subsequent teachings with a significant analytical capacity and with a well-founded method of quantitative investigation learned in this course

Final exam and grading criteria	*The measurement of learning takes place through exam tests and the attribution of the mark based on the knowledge and skills shown on site exam.*
Further information	
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