

Mathematics for Economics and Finance

a.y. 2024-2025, 1st year, 1st semester, 12 ECTS Credits

Prof. Francesco Rania

Course Information	Mathematics for Economics and Finance (SECS-S/06) 12 ECTS – 84 hours Lesson period: 1st year, 1st semester, a.y. 2024-2025
Professor Information	Prof. Francesco Rania Department of Law, Economy and Sociology Website: https://www.diges.unicz.it/web/docenti/rania-francesco/ Email: raniaf@unicz.it Phone: +39 0961 3694 4987 Office hours: during the lesson period; before and after the lessons and every month before the examination
Course Description	The course aims to provide mathematical tools in Linear Algebra, Mathematical Analysis, and Financial Mathematics to model and solve basic economic and financial problems.
Course goals and Expected Learning Outcomes	Upon course completion, a student will be able to: <ul style="list-style-type: none"> • Know and apply the tools of Mathematical Analysis • Understand and use the basic concepts of linear algebra and matrices, including linear transformations, eigenvectors and the characteristic polynomial • Know and apply arithmetic and geometric progressions, series, sequence; • Describe and solve simple static and dynamic problems in the economic and financial field; • Acknowledge and represent an equilibrium problem and decision problem in the economic and financial field.

Program	<p>Module 1 Numerical sets; Arithmetic operations; Solving equations; Simple inequalities; Calculating percentage. Set theory; propositions, theorems, connectives, implications, necessary and sufficient conditions. Functions; Composition of functions; Inverse function; Graphs.</p> <p>Topology of \mathbb{R}; Euclidean metrics; Relationships between point and set. Function of one real variable; Elementary functions; Limits (notes); Continuous functions; Derivative of function; Rules for finding the derivative; Taylor polynomial; Free and constrained Optimization; Absolute minimum and maximum.</p> <p>Module 2 Capitalization and actualization; Interest and discount; Compounding interest; Equivalent rates; Present value of a complex transaction; Incomes and loans; Amortization plans. Functions of several variables; Case $n=2$; Level curves; Continuity and derivability; Partial derivative; Quadratic Forms. Weierstrass Theorem; Fermat Theorem; Sufficient condition to calculate the local minimum and maximum; Constrained optimization; Lagrange method; Kuhn-Tucker conditions. Vector Space \mathbb{R}^n; linearly independent vectors; Bases; Linear transformations; Kernel and Image. Matrix Algebra; Square matrices; Determinants; Inverse matrix; Rank of matrix; Systems of linear equations; Gauss method. Eigenvectors and the characteristic polynomial; Diagonal matrix.</p>
	<p>Indefinite integrals; differentiation and integration; Rules for finding integrals; Definite integrals; Improper integrals.</p> <p>Difference equations of the first and second order; Differential equations of the first and second order. Linear programming; Graphical method.</p>
Expected student workload	Approximately 210 hours.
Teaching methods	<ul style="list-style-type: none"> - Lectures - Case studies - Exercises during the classroom lessons

Learning resources (textbooks, eventual further reading, ...) 	<u>Textbook</u> - K. Sydsaeter, P. Hammond, A. Strom, Metodi Matematici per l'Analisi Economica e Finanziaria, Pearson Italia, 2015. Or - M. Abate, Metodi matematici per l'Economia e il Management, Mc Graw Hill, 1 ed. 2024 <u>Further reading</u> - L. Peccati, S. Salsa, A. Squellati, Matematica per l'economia e l'azienda, Terza Edizione, Egea Editore, Milano. - A. Torriero, M. Scovenna, L. Scaglianti, Manuale di Matematica, Metodi e applicazioni, Cedam, 2013. - M. Micocci, G.B. Masala, Metodi e strumenti quantitativi per il risk management, Carocci editore 2012 (Parte Prima). - C.P. Simon, L.E. Blume, Matematica 1 per l'Economia e le Scienze Sociali, Università Bocconi Editore, 2002. - C.P. Simon, L.E. Blume, Matematica 2 per l'Economia e le Scienze Sociali, Università Bocconi Editore, 2002. - T. Bradley, Essential mathematics for Economics and Business, 4th edition Wiley.			
Support activities	Subject-specific seminars			
Attendance policy	The attendance policy is established by art. 8 of the University teaching regulation: http://www.unicz.it/pdf/regolamento_didattico_ateneo_dr681.pdf .			
Assesment Methods	The course includes intermediate assessment tests for attending students. The examination is written and oral. The student must have obtained a score of 14/30 in the written part to be able to sit for the final (oral) part.			
	Grade	Grade knowledge and understanding of the topic	Ability to analyze and synthesize	Use of references
	Fail	Severe shortcomings and inaccuracies	Irrelevant frequent generalizations. Inability to synthesize	Completely inappropriate
	18-20	Sufficient. Important shortcomings.	Sufficient capabilities	Sufficient
	21-23	Basic knowledge	The student is capable of correct analysis and synthesis, he argues	The student uses standard references

		logically and consistently	
24-26	Satisfactory. Good knowledge	The student has good analysis and synthesis skills. The arguments are expressed consistently	The student uses standard references
27-29	Very good	The student has considerable skills in analysis and synthesis	The student studies in depth the topics of the exam
30-30L	Excellent	The student has Excellent analysis and synthesis skills	Important insights