Course title **Mathematics for Economics and Finance**

Study program	**Laurea/LM/LMcu**	**A.A.**
Economics and Finance	LM	2017/2018

Teacher:	**Tel.**:	**email**:
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SSD	**CREDITS**	**Year of studies**	**Semester**
SECS-S/06	12	I	I

EXPECTED LEARNING OUTCOMES

Knowledge and understanding

The course aims to provide students with the analytical and mathematical techniques that will allow them to rigorously analyze economic and financial problems, and to introduce them to game theory.

Knowledge and applied understanding

Students should acquire the necessary skills to apply the indicated mathematical tools and methods to the solution of Micro- and Macroeconomic problems.

PROGRAM

Static and dynamic optimization. Simultaneous moves games, the representation of games in strategic form, dominant strategy equilibrium, the iterated deletion of strictly dominated strategies, pure strategy Nash equilibrium, reaction functions (best responses), finding Nash equilibria with both discrete and continuous action spaces, supermodular and submodular games.

CONTENTS

Homogeneous functions and Euler's formula. Continuous functions and compact sets. Concave and quasi concave functions. The implicit function theorem. Convex sets and separating hyperplanes: separating hyperplanes theorem, supporting hyperplanes theorem. Difference equations. Unconstrained maximization: local and global maximizer (minimizer), maximization theorems. Constrained maximization: the Lagrangian function and constraints qualification, Lagrange multipliers. Inequality constraints: Kuhn Tucker conditions. Comparative statics. Differential equations and systems of differential equations. Dynamic maximization: the calculus of variations and its applications to economic models, Euler equation of maximization problems . Control theory and applications to economic models.

Simultaneous moves games. Games in strategic form, dominant strategy equilibrium, iterated deletion of strictly dominated strategies. Reaction functions and Nash equilibrium. Finding Nash equilibria with both discrete and continuous action spaces. Supermodular and submodular games. Mixed strategies, domination by a mixed strategy and never-best-response. Rationalisability. Games in extensive form. Backward induction and information sets, Subgame perfect Nash equilibrium. Repeated games. Folk theorems. Collusion. Imperfect Information and incomplete information. Risk dominance. Forward induction. Bayesian Nash Equilibrium. Purification. Sequential rationality, consistency of beliefs and perfect Bayesian Nash Equilibrium. Signalling: separating equilibria and pooling equilibria. Spence Signalling Model.

TEXTBOOKS

Peter Hammond, Knut Sydsaeter, Atle Seierstad and Arne Strom, *"Further Mathematics for Economic Analysis".*
Robert Gibbons, "A Primer in Game Theory".
Martin Osborne, "An introduction to Game Theory".
Andreu Mas-Colell, Michael Whinston e Jerry R. Green, "Microeconomic Theory".

Some notes will be distributed in class during the course.

ASSESSMENT METHOD

a) Learning results to be verified:

The exam verifies the knowledge acquired and the ability to apply new developed skills by solving the proposed exercises.

b) Assessment Method

The total grade will be based on a final written exam

In case of a written exam, questions are*: ☐ Multiple choices X Open questions X Numerical exercises
(*) more answers possible