



## Programme of Course "Mathematical Economics and Finance"

- Code: DT0110
- Type of course unit: Elective (Bachelor Degree in Mathematics curriculum Generale), Elective (Master Degree in Mathematics curriculum Generale), Elective (Master Degree in Mathematical Engineering curriculum Comune)
- Level of course unit: Undergraduate Degrees, Postgraduate Degrees
- Semester: 1

Number of ects credits: (Master Degree in Mathematics) 6 (workload 150 hours), (Master Degree in Mathematical Engineering) 6 (workload 150 hours), (Bachelor Degree in Mathematics) 6 (workload 150 hours)

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| 1 | <b>Course objectives</b>   | I present and organize the analytical foundations underlying modern economics and finance.  |
| 2 | <b>Course content and learning outcomes (dublin descriptors)</b> | <p>Topics of the module include:</p> <ul style="list-style-type: none"> <li>• Sperner's lemma</li> <li>• The Knaster-Kuratowski-Mazurkiewicz lemma</li> <li>• Brouwer's fixed point theorem</li> <li>• Variational inequalities and equilibrium problems</li> <li>• Generalized monotonicity and convexity</li> <li>• Brézis-Nirenberg-Stampacchia theorem and Fan's minimax principle</li> <li>• Continuity of correspondences</li> <li>• Browder, Kakutani and Fan-Glicksberg fixed point theorems</li> <li>• Gale-Nikaido-Debreu theorem</li> <li>• Nash equilibrium of games and abstract economies</li> <li>• Walrasian equilibrium of an economy</li> <li>• An application to traffic network</li> </ul> <p>On successful completion of this module, the student should :</p> <ul style="list-style-type: none"> <li>• Know the fundamental fixed point theorems for set-valued maps and the basic existence results for equilibrium problems and variational inequalities.</li> <li>• Explain some interconnections among these various results.</li> <li>• Apply this analysis to game and economic theory</li> </ul> |
| 3 | <b>Course prerequisites</b>                                      | I assume familiarity with vector and topological spaces, and with the standard model of the real numbers. I assume that you know the basic facts about metric spaces, normed and seminormed spaces, Banach and Hilbert spaces.  |
| 4 | <b>Teaching methods and language</b>                             | <b>Language:</b> English  |
| 5 | <b>Assessment methods</b>  | Written and oral  |