

# Mathematics for Economics and Finance

2019-2020 Academic Year  
Master of Research in Economics, Finance and Management

## 1. Description of the subject

- Subject name: Mathematics for Economics and Finance      Code: 31559
- Total credits: 6 ECTS      Workload: 150 hours
- Term: 1<sup>st</sup>
- Type of subject: Elective
- Department of Economics and Business
- Lecturer: Piotr Zwiernik (piotr.zwiernik@upf.edu)

## 2. Teaching guide

### • Introduction

The purpose of this course is to teach the basics of rigorous mathematical reasoning and essential tools of mathematical analysis for economics and mathematical finance. The course concentrates on differentiation of functions of several variables and related topics and includes an introduction to the basic notions of topology, convergence, and continuity. The course provides basic necessary material to study more advanced topics in optimization and mathematical economics.

### • Contents

0. Elements of mathematical thinking and foundations: basic logic and set theory; proof by induction, proof by contradiction; the set of real numbers.

1. Metric spaces: Sequences, convergence; basic topology, open, closed.
2. Real functions: continuous functions, uniform continuity; compact sets.
3. Convexity: Convex sets; affine independence; convex functions.
4. Fixed point theorems: Contractions; Brouwer's fixed point theorem; price equilibrium, Nash equilibrium.
5. Differentiation: Functions of several variables; linear transformations; derivative, partial derivatives, directional derivatives; inverse function theorem; implicit function theorem; derivatives of higher order.

#### ⚙ Teaching methodology and materials

The material is presented on a blackboard with rigorous proofs, based primarily on the lecture notes, which will be made available before the term starts (see also the lecturer's website).

Some additional reading:

1. Walter Rudin, Principles of Mathematical Analysis, International Series in Pure and Applied Mathematics.

#### ⚙ Assessment

Weekly homework sets are handed out containing exercises that the students are strongly encouraged to solve in order to master the necessary techniques. Bonus points are earned by solving especially marked, more difficult exercises. The final grade is based on performance at a final (open-note) exam 70% and overall performance during the exercise sessions 30%.