Name of subject: QUANTITATIVE METHODS	**Contact:** jordi.caballe at uab.cat
Code: OB	**Term:** Year 1, Semester 1
ECTS Credits: 15	**Working language:** English

Instructors

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Objectives and Contextualization

This module provides the student with the advanced quantitative tools that are necessary for economic analysis. This module covers optimization, probability, statistics and game theory. The module is organized in three sections. The first section covers the foundations of optimization theory. The second section provides students with the theoretical foundations of probability and statistics necessary for econometric and financial analysis. The third section is devoted to game theory; it provides the student with the mathematical framework that is necessary to analyze multi-personal decision theory problems.

Skills

CB6	To acquire the knowledge that provides the basis for originality in developing and/or applying ideas, often in a research context
CB10	Students must have the learning skills necessary to continue studying in a way that is, mostly, self-directed and autonomous

Learning Outcomes

Specific:

E01	Ability to articulate the fundamentals of economic theory analytically, deriving them with mathematical reasoning
E01.01	Ability to determine which are the necessary theoretical elements and assumptions that are needed to be able to model a decision problem with simple strategic interactions
E01.02	To use mathematics to analyze economic problems
E02	Ability to identify the fundamentals of statistical analysis and econometric techniques, deriving them from the laws of probability and statistics
E02.01	To describe statistical issues on which the stochastic economic analysis and empirical analysis is based
E04	To analyze a particular economic problem using advanced analytical tools
E04.01	To frame an economic decision problem as mathematical problem in a strategic framework and derive its response with mathematical logic

Activities

Type	Hours
Directed	112.5
Supervised	75
Autonomous	187.5

Methodology

- Theory classes
- Practice classes
- Learning based on problem solving
- Tutorials
- Personal study
- Study groups
- Textbook reading
- Article reading

Evaluation

Final Exam	80%
Class attendance and active participation	10%
Problem sets and assignments	10%

Contents

Optimization

1. Topology
2. Continuity
3. Differentiability
4. Convexity
5. Static Optimization
6. Dynamic Systems

Probability and Statistics

7. Probability and Measure Theory
8. Random Variables and Distributions
9. Expectation
10. Special Distributions
11. Functions of Random Variables
12. Stochastic Processes and Limiting Distributions
13. Sampling

14. Estimation
15. Hypothesis Testing
16. Choice under Uncertainty

Game Theory

17. Introduction and Some Examples
18. Games in Normal Form
19. Games in Extensive Form
20. Nash Equilibrium and Related Issues
21. Repeated Games
22. Games of Incomplete Information
23. Bargaining Theory
24. Cooperative Games

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