Mathematical optimization for Economics

Academic Year: (2022 / 2023) **Review date: 20-05-2022**

Department assigned to the subject: Economics Department

Coordinating teacher: RINCON ZAPATERO, JUAN PABLO

Type: Compulsory ECTS Credits : 3.0

Year : 1 Semester : 2

REQUIREMENTS (SUBJECTS THAT ARE ASSUMED TO BE KNOWN)

Introductoy Mathematics for Economics
Mathematics for Economics I

OBJECTIVES

This subject provides the quantitative instruments that are needed to pose and analyze economic problems with the aid of a formal model.

In working toward the above goal the student will acquire the following competences and skills.

Regarding the contents of the course, the student will be able of:
- Understand the tools of mathematical analysis used in the resolution of otimization problems
- Analyze economic models set as optimization problems without constraints, with equality constraints, or with inequality constraints
- Know how to interpret the Lagrange and the Khun-Tucker multipliers, to make comparative statics in economics problems and to use the Envelope Theorem to make qualitative study of optimization problems, with a view to economic applications.

Pertaining the general competences or skills, in the class the student will develop:
- The ability to address economic problems by means of abstract models.
- The ability to solve the above formal models.
- The ability to interpret and classify the different solutions and apply the appropriate conclusions to social contexts.
- The ability to use the basic tools that are need in the modern analysis of economic problems.

Through out the course, the student should maintain:
- An inquisitive attitude when developing logical reasoning, being able to tell apart a proof from an example.
- An entrepreneurial and imaginative attitude towards the cases studied.
- A critical attitude towards the formal results and their applicability in social contexts.

DESCRIPTION OF CONTENTS: PROGRAMME

Topic 1: Optimization without constraints

- Optimization in open sets. First and second order necessary conditions. Second order sufficient conditions.
- Global extrema of concave/convex functions.

Topic 2: Optimization with equality constraints

- Local and global relative extremum. Lagrangian and Lagrange multipliers. First order necessary conditions. Second order sufficient conditions.
- Optimization of concave/convex functions with equality constraints.
- Economic interpretation of the Lagrange multipliers.

Topic 3: Optimization with inequality constraints

- Formulation of the problem. Kuhn-Tucker necessary and sufficient conditions
- Comparative statics: value function and Envelope Theorem.
- Convex programming.
- Economic interpretation of the Kuhn-Tucker multipliers.

LEARNING ACTIVITIES AND METHODOLOGY

The course lectures will be based on combining theoretical explanations with several practical exercises. The students should attempt to solve the exercises by themselves, before they are addressed in class.

Student participation is considered very important in order to acquire the skills needed to pose and solve economic models.

ASSESSMENT SYSTEM

The final grade is the weighted average of the final exam and the class grade. The final exam is the same for all the Mathematical Optimization for Economics groups and consists of practical exercises and theoretical questions.

The continuous evaluation consists of the weighted sum of the grade obtained in class and the grade obtained in a final exam.
The class grade is determined in a unique midterm.

Ordinary exam: The final grade is the weighted average of 60% of the final exam grade and 40% of the class grade.

Extraordinary exam: The final grade is the maximum of a) and b) below
a) A weighted average consisting of 60% of the final exam grade and 40% of the class grade
b) Final exam

% end-of-term-examination:	60
% of continuous assessment (assigments, laboratory, practicals…):	40

BASIC BIBLIOGRAPHY

- Alpha C. Chiang y Kevin Wainwright Fundamental methods of mathematical economics, Mc Graw Hill, 2006.

- Knut Sydsaeter y Peter J. Hammond Mathematics for economic analysis, Prentice Hall, 1995.