27408 - Mathematics II

Información del Plan Docente

Academic Year	2016/17
Academic center	109 - Facultad de Economía y Empresa
Degree	417 - Degree in Economics
ECTS	6.0
Course	1
Period	Second semester
Subject Type	Basic Education
Module	---

1.Basic info

1.1.Recommendations to take this course

1.2.Activities and key dates for the course

2.Initiation

2.1.Learning outcomes that define the subject

2.2.Introduction

3.Context and competences

3.1.Goals

3.2.Context and meaning of the subject in the degree

3.3.Competences

3.4.Importance of learning outcomes

4.Evaluation

5.Activities and resources

5.1.General methodological presentation

The objective of this subject is that the students should develop the analytical skills, rigour and intuition needed for using mathematical concepts and results and that they should be able to apply these abilities to the analysis of problems of an economic nature. Therefore, the teaching should aim to provide students with a solid mathematical knowledge and to train them in a way of reasoning that will allow them thereafter to successfully solve a wide variety of questions in an economic scenario.

5.2.Learning activities

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The program offered to the students to help them achieve the learning results includes the following activities:

1. Theoretical lessons which will be based on lectures to present the concepts and results corresponding to the contents. At the same time, some exercises will be solved with the participation of the students to help them comprehend the theoretical concepts presented. These classes are face-to-face and will be given to the full group.

Time allotted: 1.2 ECTS credits (30 hours).

2. Practical lessons , in which the students will apply the theoretical results in order to solve, with the teacher's help, more complete exercises, and problems of an economic nature. Problem sheets will be available for the students and the teacher will announce in advance the problems that will be solved in each practical lesson so that the students can prepare them beforehand. These classes are face-to-face and will be given separately to each subgroup.

Time allotted: 1.2 ECTS credits (30 hours each subgroup).

3. Seminars (practical classes P6), which may consist of a number of different activities designed to support the learning process, including: follow-up of some simple projects that had been assigned to small teams of students and the presentation of these projects; answering questions that students may have regarding some of the contents taught; solving problems of an economic nature by using some of the mathematical tools taught during the classes, etc. These seminars may also be devoted to the teaching of more advanced topics, intended for the students interested in learning some further mathematical tools that would allow them to deal with more general problems. In this way, the students are shown that both Mathematics and Economics are vibrant sciences with many facets to be studied.

Time allotted: Subject to an agreement of *the Junta de Facultad.*

4. Out of class work : 3.6 ECTS credits.

5.3.Program

The contents detailed in the program below will be developed in the theoretical and practical classes. Any variations in the order in which the topics will be taught will be indicated by the teacher in the presentation of the subject.

PART I. MATHEMATICAL PROGRAMMING

Unit 1: Mathematical programmes

1.1. General form of a mathematical programme. Classification.

1.2. Definitions and properties. Weierstrass theorem.

1.3. Introduction to convexity.

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1.3.1. Convex set. Definition and properties.

1.3.2. Convex and concave functions. Definitions and properties.

1.3.3. Convex programmes.

1.4. Solving programmes using the graphical method.

Unit 2: Unconstrained programming

2.1. Form of the problem.

2.2. Local optima.

2.2.1. First-order conditions for local optima.

2.2.2.Second-order conditions for local optima.

2.3. Global optima. Convex programmes.

Unit 3: Programming with equality constraints

3.1. Form of the problem.

3.2. Local optima.

3.2.1. First-order conditions for local optima.

3.2.2. Second-order conditions for local optima.

3.3. Global optima. Convex programmes and Weiertrass theorem.

3.4. Economic interpretation of Lagrange multipliers.

Unit 4: Linear programming

4.1. Form of the problem.

4.2. Solutions of a linear programme. Basic feasible solutions.

4.3. The simplex algorithm.

4.3. Duality.

4.4. Post-optimal analysis.

PART II. Dynamical analysis

Unit 5: Introduction to ordinary differential equations.

5.1.Introduction to dynamical analysis.

5.2. Concepts of differential equation, solution, and types of solutions.

5.3. First-order ordinary differential equations:

5.3.1. Differential equations with separable variables.

5.3.2. Homogeneous differential equations.

5.3.3. Exact differential equations.

5.3.4. Linear first-order differential equations.

5.4. Linear differential equations of order n with constant coefficients:

5.4.1. Basic definitions and fundamental theorems.

5.4.2. General solution of the complete equation.

5.4.Planning and scheduling

In the first session of the semester it will be presented in each group the detailed schedule of the subject according to the characteristics of the academic year.

5.5.Bibliography and recomended resources

The recommended readings are usually available in the University Library's data base (go to 'bibliografia recomendada' in 'biblioteca.unizar.es').