

## Course guides

### 205110 - 205110 - Game Theory

**Last modified:** 22/04/2021

**Unit in charge:** Terrassa School of Industrial, Aerospace and Audiovisual Engineering  
**Teaching unit:** 749 - MAT - Department of Mathematics.

**Degree:** MASTER'S DEGREE IN TECHNOLOGY AND ENGINEERING MANAGEMENT (Syllabus 2016). (Optional subject).

**Academic year:** 2021    **ECTS Credits:** 7.5    **Languages:** English

#### LECTURER

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**Coordinating lecturer:** Francesc Carreras Escobar

**Others:**

#### DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

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**Specific:**

CE03-MEM. The ability to optimise problems and systems using mathematical models and make decisions in conditions of uncertainty.

CE04-MEM. The ability to apply theoretical and fundamental principles of technology and engineering business management in conditions of uncertainty.

CE06-MEM. The ability to optimally assign physical and financial resources in process and project management in technological settings.

CE08-MEM. The ability to evaluate the results of process and project development in technological settings subject to levels of process uncertainty.

CE10-MEM. The ability to develop and defend a comprehensive technology and engineering business management project.

**Transversal:**

CT1a. ENTREPRENEURSHIP AND INNOVATION: Being aware of and understanding how companies are organised and the principles that govern their activity, and being able to understand employment regulations and the relationships between planning, industrial and commercial strategies, quality and profit.

CT2. SUSTAINABILITY AND SOCIAL COMMITMENT: Being aware of and understanding the complexity of the economic and social phenomena typical of a welfare society, and being able to relate social welfare to globalisation and sustainability and to use technique, technology, economics and sustainability in a balanced and compatible manner.

CT3. TEAMWORK: Being able to work in an interdisciplinary team, whether as a member or as a leader, with the aim of contributing to projects pragmatically and responsibly and making commitments in view of the resources that are available.

CT4. EFFECTIVE USE OF INFORMATION RESOURCES: Managing the acquisition, structuring, analysis and display of data and information in the chosen area of specialisation and critically assessing the results obtained.

#### TEACHING METHODOLOGY

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Lecture: Lecturers present concepts, results and techniques, with the active participation of students.

Problem Based Learning: Lecturers and students solve exercises and standard problems through specific techniques related to the theoretical contents and principles of the course.

Project Based Learning: Students solve complex problems through specific techniques related to the theoretical contents and principles of the course.

Self-study: Students diagnose their learning needs, in collaboration with the lecturers, and plan their own learning process.

## LEARNING OBJECTIVES OF THE SUBJECT

The course introduces the aim and methodology of Game Theory, a branch of Operations Research devoted to the analysis of conflicts of interest. The convenience of applying game theory to solve decision-making problems in engineering management is illustrated by means of a variety of examples of this and other fields of knowledge.

## STUDY LOAD

Type	Hours	Percentage
Self study	127,5	68.00
Hours large group	30,0	16.00
Hours medium group	30,0	16.00

**Total learning time:** 187.5 h

## CONTENTS

### Module 1: Noncooperative Games and Strategies

#### Description:

Representations of noncooperative conflicts: essential elements. Finite and infinite games, with or without constant sum. Optimal strategies and Nash equilibria. Cournot and Bertrand duopoly models and product differentiation.

#### Related activities:

Distance and in-class activities  
Group project (First part)  
Final exam

#### Full-or-part-time: 97h 30m

Theory classes: 15h  
Practical classes: 15h  
Self study : 67h 30m

### Module 2: Cooperative Games and Sharing Rules

#### Description:

Communication, cooperation and negotiation. Sharing rules for costs, profits, savings and transferable utilities in general. Economic games: the Shapley value. Political games: the Shapley-Shubik power index.

#### Related activities:

Distance and in-class activities  
Group project (Option 2)  
Final exam

#### Full-or-part-time: 90h

Theory classes: 15h  
Practical classes: 15h  
Self study : 60h

## GRADING SYSTEM

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The final grade depends on the following three elements:

- \* 30%, Distance and in-class activities
- \* 40%, Group project (report and dissertation)
- \* 30%, Final exam