

## 205105 - Tools for Decision Making

Coordinating unit:	205 - ESEIAAT - Terrassa School of Industrial, Aerospace and Audiovisual Engineering		
Teaching unit:	732 - OE - Department of Management		
Academic year:	2018		
Degree:	MASTER'S DEGREE IN TECHNOLOGY AND ENGINEERING MANAGEMENT (Syllabus 2016). (Teaching unit Compulsory)		
ECTS credits:	7,5	Teaching languages:	English

### Teaching staff

Coordinator:	Vicenç Fernández Alarcón
Others:	Lordan Gonzalez, Oriol

### Degree competences to which the subject contributes

#### Basic:

- CB6. Knowledge and understanding that provides a basis or opportunity for originality in the development and/or application of ideas, often in a research context.
- CB7. METMF\_The ability to apply the knowledge and problem-solving skills acquired in new or unfamiliar environments within wider (or multidisciplinary) contexts related to the area of study.
- CB8. METMF\_The ability to integrate knowledge and deal with the complexity of making judgements on the basis of information that, albeit incomplete or limited, includes thoughts on the role played by social and ethical responsibility in the application of knowledge and judgement.
- CB9. METMF\_The ability to communicate conclusions, and the knowledge and reasons that ultimately sustain these conclusions, to specialised and lay audiences in a clear and unambiguous way.
- CB10-METP. Learning abilities that will enable students to keep studying in a largely self-directed or independent manner.

#### Specific:

- CE02-MEM. The ability to analyse data for pattern recognition.
- 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.

#### 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.

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### Teaching methodology

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

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

Project Based learning: Students resolve 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 Tools for Decision Making introduces students to the concepts, principles and techniques of data analysis, linear programming, integer-mixed linear programming, and Markov chains for making smart and successful decisions in different contexts.

### Study load

Total learning time: 187h 30m	Hours large group:	30h	16.00%
	Hours medium group:	30h	16.00%
	Self study:	127h 30m	68.00%

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### Content

#### Module 1: Data Analysis

Learning time: 67h 30m

Theory classes: 10h  
Practical classes: 10h  
Self study : 47h 30m

##### Description:

The goal of this module is to identify relationships between variables that are particularly interesting or unexpected, to check if there is any evidence for or against a stated hypothesis, to check for problems with the collected data, such as missing data or measurement error, or to identify certain areas where more data need to be collected.

Getting Started with R  
Managing Data Frames  
Data Analysis Checklist  
Principles of Analytic Graphics  
Exploratory Graphs  
Clustering Analysis  
Plotting and Color in R

##### Related activities:

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

#### Module 2: Linear Programming

Learning time: 60h

Theory classes: 10h  
Practical classes: 10h  
Self study : 40h

##### Description:

The goal of this module is to model industrial and service situations (problems about production, logistics, marketing, finance and human resources) through linear programming, to resolve them using different software, such as R, and to take efficient decisions from the results of the models.

Introduction to Quantitative Methods  
Fundamentals of Linear Programming  
Types of Linear Programming Models  
Duality and Sensitivity Analysis  
Integer and Mixed Linear Programming

##### Related activities:

Distance and in-class activities  
Group project (Second part)  
Final exam  
Online self-Assessment

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<p>Module 3: Markov Chains</p>	<p>Learning time: 60h Theory classes: 10h Practical classes: 10h Self study : 40h</p>
<p>Description: The goal of this module is to model industrial and service situations (problems about production, logistics, marketing, finance and human resources) through Markov Chains, to resolve them using different software, such as R, and to take efficient decisions from the results of the models.</p> <p>Introduction to Markov chains Simple Markov chains Reward Markov chains Reward Markov chains with decision Dynamic Programming</p> <p>Related activities: Distance and in-class activities Group project (Second part) Final exam Online self-Assessment</p>	

### Qualification system

The final grade depends on the following three elements:

- \* 30%, Distance and in-class activities (any activity will have a weight greater than 5%)
- \* 40%, Group project (report and dissertation)
- \* 30%, Final exam

### Bibliography