

## Course guides

# 205105 - 205105 - Tools for Decision Making

Last modified: 30/04/2021

**Unit in charge:** Terrassa School of Industrial, Aerospace and Audiovisual Engineering  
**Teaching unit:** 732 - OE - Department of Management.

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

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

### LECTURER

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**Coordinating lecturer:** Fernandez Alarcon, Vicenç

**Others:** Sallan Leyes, Jose Maria

### DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

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#### 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.

#### 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.

## 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 explorative data analysis, linear programming, and integer-mixed linear programming for making smart and successful decisions in different contexts.

## STUDY LOAD

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

**Total learning time:** 187.5 h

## CONTENTS

### Module 1: Explorative Data Analysis

#### 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, Reading Data Sets, and Managing Data Sets

Cleaning Data Sets, Data Analysis Checklist

Principles of Analytic Graphics, Exploratory Graphs, Plotting and Color in R

Testing Hypotheses, 1-way and 2-way ANOVA, Linear Regression Models

Reporting Analysis, Presenting Analysis

#### Related activities:

Distance and in-class activities

Group project

Online self-Assessment

#### Full-or-part-time: 120h

Theory classes: 20h

Practical classes: 20h

Self study : 80h



## Module 2: Linear Programming

### 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  
Final exam  
Online self-Assessment

### Full-or-part-time: 67h 30m

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

## GRADING 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

For those students who meet the requirements and submit to the reevaluation examination, the grade of the reevaluation exam will replace the grade of the final exam, and the grades obtained during the course for activities and projects will be kept.

If the final grade after reevaluation is lower than 5.0, it will replace the initial one only if it is higher. If the final grade after reevaluation is greater or equal to 5.0, the final grade of the subject will be pass 5.0.

## BIBLIOGRAPHY

### Basic:

- Sallán Leyes, José María; Lordan, Oriol; Fernández Alarcón, Vicenç. Modeling and solving linear programming with R [Rekurs electrònic] . [S.l.] : OmniaScience, 2015. ISBN 978-84-944229-3-5 .
- Fernandez, Vicenc. Fundamentals of Research Methodology [on line]. OmniaScience. Terrassa: OmniaScience, 2020 [Consultation: 03/06/2020]. Available on: <https://www.omniascience.com/books/index.php/scholar/catalog/book/115>. ISBN 8412064399.

## RESOURCES

### Hyperlink:

- Github by Jose M Sallan . Content, Data Sets, and Scripts: <https://github.com/jmsallan>
- Github by Vicenc Fernandez. Content, Data Sets, and Scripts: <https://github.com/vicencfernandez>