1. OVERVIEW

Subject area	Operations Research
Degree	Bachelor's Degree in Industrial Organisation Engineering
School/Faculty	*Faculty of Science, Engineering and Design*
Year	Third-party
ECTS	9 ECTS
Type	Compulsory
Language(s)	Spanish
Delivery Mode	On campus
Semester	Semester 6

2. INTRODUCTION

Operations Research teaches decision-making through the construction and resolution of a mathematical model which reflects a real-life situation. For this, students must choose the most suitable tools at their disposal.

The subject provides students with these quantitative tools to successfully deal with the main types of problems encountered in the field of operations. As a result, students will be able to design a model for a particular situation using the right tool and reach the correct decision to solve this model in the context of industrial organisation.

3. SKILLS AND LEARNING OUTCOMES

Basic skills (CB, by the acronym in Spanish):

- CB2: Students can apply their knowledge to their work or vocation in a professional manner and possess the skills which are usually evident through the forming and defending of opinions and resolving problems within their study area.
- CB4: Students can communicate information, ideas, problems and solutions to both specialist and non-specialist audiences.
- CB5: Students have developed the learning skills necessary to undertake further study in a much more independent manner.

Cross-curricular skills (CT, by the acronym in Spanish):

- CT01: Ethical values: ability to think and act in line with universal principles based on the value of a person, contributing to their development and involving commitment to certain social values.
- CT02: Independent learning: skills for choosing strategies to search, analyse, evaluate and manage information from different sources, as well as to independently learn and put into practice what has been learnt.

- CT03. Teamwork: ability to integrate and collaborate actively with other people, areas and/or organisations to reach common goals.
- CT04. Written/spoken communication: ability to communicate and gather information, ideas, opinions and viewpoints to understand and be able to act, spoken through words or gestures or written through words and/or graphic elements.
- CT05. Analysis and problem-solving: be able to critically assess information, break down complex situations, identify patterns and consider different alternatives, approaches and perspectives in order to find the best solutions and effective negotiations.
- CT06. Adapting to change: be able to accept, consider and integrate different perspectives, adapting your own approach as required by the situation at hand, and to work effectively in ambiguous situations.
- CT08. Entrepreneurial spirit: ability to take on and carry out activities that generate new opportunities, foresee problems or lead to improvements.

Specific skills (CE, by the acronym in Spanish):

- CE08 - Ability to use basic knowledge of production and manufacturing systems in industrial organisation processes.
- CE13 - Ability to apply design and management techniques and tools to control production and operations in industrial organisation.

Learning outcomes (RA, by the acronym in Spanish):

- RA1. Solve problems regarding optimisation, planning of demand, supply and materials management in a productive system.
- RA2. Solve assignment and transport issues, problems in the decision-making process, and manage inventories and queue management.
- RA3. Apply the principles of a smart and connected industry to an industrial organisation.

The following table shows how the skills developed in the subject area match up with the intended learning outcomes:

Skills	Learning outcomes (RA, by the acronym in Spanish)
CB02, CB05, CT01, CT02, CT03, CT04, CT05, CT06, CT08, CE08, CE013	RA1. Solve problems regarding optimisation, planning of demand, supply and materials management in a productive system.
CB02, CB04, CB05, CT01, CT02, CT03, CT04, CT05, CT06, CT08, CE08, CE13	RA2. Solve assignment and transport issues, problems in the decision-making process, and manage inventories and queue management.
CB02, CB04, CB05, CT01, CT02, CT03, CT04, CT05, CT06, CT08, CE08, CE13	RA3. Apply the principles of a smart and connected industry to an industrial organisation.

4. CONTENTS

This subject area deals with the following topics:

1. Linear programming.
2. Sensitivity analysis.
3. Network analysis.
4. Decision analysis.
5. Game theory.

6. Queuing theory.
7. Markov chains.
8. Optimisation.
9. Machine learning.
10. Introduction to ICT tools for operations research.
11. Applications in the smart industry.

5. TEACHING/LEARNING METHODS

The types of teaching/learning methods are as follows:

- Master lectures
- Collaborative learning
- Problem-based learning
- Project-based learning
- Learning based on learning based on laboratory teaching (simulation environments)
- Case study
- Gamification
- Field work.

6. LEARNING ACTIVITIES

The types of learning activities, plus the amount of time spent on each activity, are as follows:

Learning activity	Number of hours
Master lectures and practical seminars	39
Problem-solving	25
Case studies and field studies	10
Laboratory work	36
Debates and discussions	12
Learning contract (definition of interests, needs and objectives)	3
Autonomous learning	87
Tutorials	10
Knowledge tests	3
TOTAL	**225**

7. ASSESSMENT

The assessment systems, plus their weighting in the final grade for the subject area, are as follows:

Assessment system	Weighting
On Campus tests to evaluate objectives of theory/practical learning (exam-type objective tests, written compositions, oral presentations, case studies/problem solving, debates, simulation tests)	50%
Off-site tests to assess theory/practical learning (case studies/problem-solving)	30%
Attitude assessment tests (attitude assessment rubrics, class participation)	10%
Self- and co-assessment (learning contract, learning outcomes)	10%

On the Virtual Campus, when you open the subject area, you can see all the details of your assessment activities and the deadlines and assessment procedures for each activity.

8. BIBLIOGRAPHY

The reference publication to accompany this subject area is:

- Taha, H. A. (2004). Investigación de operaciones. Pearson Educación.
- Hillier, F. S., & Lieberman, G. J. (2010). Introducción a la investigación de operaciones.
- Prawda Witenberg, J. (1976). Métodos y modelos de investigación de operaciones. Vol. I. Editorial Limusa SA, México.

This is the basic bibliography for this subject. There are also many more specific references to use.