

## 1. BASIC INFORMATION

Course	Operatons Research
Degree program	Industrial Organization Engineering
School	School of Science, Engineering and Design
Year	Third Year
ECTS	9 ECTS
Credit type	Mandatory
Language(s)	Spanish/ English
Delivery mode	Face-to-face class
Semester	6 <sup>th</sup>
Academic year	2024-2025
Coordinating professor	Ralph Michaud
Professor	Ralph Michaud

## 2. PRESENTATION

Operations Research facilitates decision making by building and solving a mathematical model that represents a real situation. To do this, it is necessary to select and use the most appropriate tools.

The Operations Research subject provides students with the quantitative tools necessary to successfully address the main types of problems in the field of operations. Thus, the subject aims to enable the student to design the model of a specific situation by choosing the appropriate tool and solve the model for appropriate decision making in the context of industrial organization.

## 3. LEARNING OUTCOMES

### Skills

SK12 - Apply techniques and tools for the design and management of the production and operations of an industrial organization.

- Solve optimization, demand planning, procurement and materials management problems in a production system.
- Solve allocation and transportation, decision making, inventory and queue management problems.

### Competences

CP04 - Organize, manage and defend a project in the field of industrial organization engineering.

CPT01 - Create new ideas and concepts from known ideas and concepts, reaching conclusions or solving problems, challenges and situations in an original way in the academic and professional environment.

CPT02 - Transmit messages (ideas, concepts, feelings, arguments), both orally and in writing, strategically aligning the interests of the different agents involved in communication in the academic and professional environment.

CPT05 - Cooperate with others in the achievement of a shared academic or professional objective, participating actively, empathetically and exercising active listening and respect for all members.

CPT06 - Integrate analysis with critical thinking in a process of evaluating different ideas or professional possibilities and their potential for error, based on objective evidence and data leading to effective and valid decision making.

CPT07 - Adapt to adverse, unexpected situations that cause stress, whether personal or professional, overcoming them and even turning them into opportunities for positive change.

CPT08 - Show ethical behavior and social commitment in the performance of the activities of a profession, as well as sensitivity to inequality and diversity.

## 4. CONTENT

The subject covers the following contents:

1. Linear programming.
2. Sensitivity analysis.
3. Network analysis.
4. Decision analysis.
5. Game theory.
6. Queuing theory.
7. Markov chains.
8. Optimization.
9. Machine learning.
10. Introduction to ICT tools for operations research.
11. Applications in the Intelligent Industry.

## 5. TEACHING-LEARNING METHODOLOGIES

The types of teaching-learning methodologies used are indicated below:

- Master classes
- Cooperative learning
- Problem-based learning
- Project Based Learning
- Learning based on laboratory teaching (simulation environments)

- Case Method
- Gamification
- Field experiences.

## 6. LEARNING ACTIVITIES

Listed below are the types of learning activities and the number of hours the student will spend on each one:

### Campus-based mode:

Learning activity	Number of hours
Master classes and practical seminars	39
Problems resolution	25
Case studies and field studies	10
Laboratory practices	36
Debate and colloquium	12
Learning contract (definition of interests, needs and objectives)	3
Self-study	87
Tutoring	10
Knowledge tests	3
<b>TOTAL</b>	<b>225</b>

## 7. ASSESSMENT

Listed below are the assessment systems used and the weight each one carries towards the final course grade:

### Campus-based mode:

Assessment system	Weight
In-person tests to evaluate theoretical/practical content objectives (objective multiple-choice tests, written presentations, oral presentations, case studies/problem solving, debates, simulation tests)	50%
Non-face-to-face tests to evaluate theoretical/practical content objectives (case studies/problem solving)	30%
Tests to evaluate attitudes (attitude evaluation rubrics, class participation)	10%
Self-assessment and co-assessment tests (learning contract, learning objectives)	10%

When you access the course on the *Campus Virtual*, you'll find a description of the assessment activities you have to complete, as well as the delivery deadline and assessment procedure for each one.

### 7.1. First exam period

To pass the course in the first exam period, you must obtain a final course grade of at least 5 out of 10 (weighted average).

In any case, you will need to obtain a grade of at least 5.0 in the any of the objective tests in order to pass the course and for them to count towards the final grade along with all the grades corresponding to the other activities.

If it is suspected that you have copied in any test or evaluable activity and you are not able to prove otherwise or that you possess the necessary knowledge and skills, the same will be evaluated with a grade of 0. Higher penalties may be considered according to the General Coexistence Regulations of the University.

In order to be eligible for the first exam period it is essential that the student reaches a minimum of 50% of class attendance. Cases that do not meet this requirement, except for justifications with evidence approved by the University, will only be eligible for the second exam period.

Virtual attendance (Hyflex) to the sessions is allowed only in justified cases and approved by the University, otherwise it will be recorded as non-attendance.

### 7.2. Second exam period

To pass the course in the second exam period, you must obtain a final grade of at least 5 out of 10 (weighted average).

In any case, you will need to obtain a grade of at 5.0 in the final exam in order for it to count towards the final grade along with all the grades corresponding to the other activities.

The student must deliver the activities not successfully completed in the first exam period after having received the corresponding corrections from the professor, or those that were not delivered in the first place.

## 8. SCHEDULE

This table shows the delivery deadline for each assessable activity in the course:

Assessable activities	Deadline
Linear Programming and Sensitivity Analysis Problem	Week 4-6

Deliver and presentation Linear Programming and Sensitivity Analysis	Week 6-8
Partial objective test	Week 8-9
Delivers network analysis, decision analysis and game theory	Week 10-13
Deliver Markov Chains	Week 13-14
Final delivery and presentation: Queuing theory	Week 15
Final objective test	Week 16

This schedule may be subject to changes for logistical reasons relating to the activities. The student will be notified of any change as and when appropriate.

## 9. BIBLIOGRAFÍA

The main reference work for this subject 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.

## 10. EDUCATIONAL GUIDANCE AND DIVERSITY UNIT

From the Educational Guidance and Diversity Unit we offer support to our students throughout their university life to help them reach their academic achievements. Other main actions are the students inclusions with specific educational needs, universal accessibility on the different campuses of the university and equal opportunities.

From this unit we offer to our students:

1. Accompaniment and follow-up by means of counselling and personalized plans for students who need to improve their academic performance.
2. In terms of attention to diversity, non-significant curricular adjustments are made in terms of methodology and assessment for those students with specific educational needs, pursuing an equal opportunities for all students.
3. We offer students different extracurricular resources to develop different competences that will encourage their personal and professional development.
4. Vocational guidance through the provision of tools and counselling to students with vocational doubts or who believe they have made a mistake in their choice of degree.

Students in need of educational support can write to us at:

[orientacioneducativa.uev@universidadeuropea.es](mailto:orientacioneducativa.uev@universidadeuropea.es)

## **11. ONLINE SURVEYS**

Your opinion matters!

The Universidad Europea encourages you to participate in several surveys which help identify the strengths and areas we need to improve regarding professors, degree programs and the teaching-learning process.

The surveys will be made available in the “surveys” section in virtual campus or via e-mail.

Your assessment is necessary for us to improve.

Thank you very much for your participation.