

Degree programme	Type	Course
Business Administration and Management	OB	3
Economics	OP	3
Economics	OP	4

Contact lecturer

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Teaching staff

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Group languages

You can consult this information at the [end](#) of the document.

Prerequisites

Those established by the current public regulations for university degree studies.

Objectives

General objective

This course is an introduction to Operations Research that provides students with the basic analytical tools to formulate, solve, and interpret quantitative models to support decision-making in business and economic contexts.

Specific objectives

- Understand the theoretical and methodological foundations of optimization and its scope for supporting decision-making.
- Identify and formulate optimization models that represent real-world situations related to the efficient allocation of resources (production planning, logistics, finance, human resource management, etc.).
- Use computer tools to efficiently implement and solve models.
- Solve, critically interpret, and use results to improve decision-making.
- Interpret the results obtained and assess their validity and usefulness in business decision-making or

economic process analysis.

Learning outcomes

1. Capacity to continue future learning independently, acquiring further knowledge and exploring new areas of knowledge.
2. Select and generate the information needed for each problem, analyse it and make decisions based on this information.
3. Make decisions in situations of uncertainty and show an enterprising and innovative spirit.
4. Use available information technology and be able to adapt to new technological settings.
5. Apply algorithmic resolution techniques to optimisation problems.
6. Solve problems optimising and obtaining forecasts through information technology applications.
7. Differentiate between alternative methods of analysis, and apply the appropriate quantitative tools to resolve business management problems.
8. Apply the basic principles of modelling in business decision-making.

Contents

TOPIC 1. Introduction to Operations Research and Mathematical Modelling

1. What is Operations Research?
2. Applications of OR
3. Types of problems
4. Mathematical modelling
5. Formulating optimization problems
6. Methods for solving optimization problems

TOPIC 2. Introduction to Linear Programming

1. Basic principles of LP
2. Ways to express an LP
3. Transformations
4. Graphical solution of LPs
5. Types of solutions

TOPIC 3. The Simplex Algorithm

1. Extreme points and optimality
2. Basic feasible solutions
3. The algebra of the simplex method
4. Tableau representation
5. Unbounded and infeasible LPs

TOPIC 4. Sensitivity Analysis and Duality

1. The role of duality
2. Economic interpretation
3. Basic concepts of sensitivity analysis
4. Changes in available resources
5. Changes in coefficients

TOPIC 5. Transportation and Assignment Problems

1. The transportation problem
2. Balanced transportation problems
3. Integer problems and totally unimodular matrices
4. Assignment problems
5. Matching problems

TOPIC 6. Software for Solving LP Problems Numerically

1. Basic programming in LINGO
2. Syntax
3. Interpretation of results

Learning activities and methodology

Title	Hours	ECTS	Learning outcomes
Tutorials and follow-up.	10	0.4	1, 5, 7, 8
Problem solving classes	17	0.68	1, 2, 3, 4, 5, 6, 7, 8
Study of the course content and completion of practical activities.	87	3.48	1, 2, 3, 4, 5, 6, 7, 8
Theory classes	32.5	1.3	1, 2, 3, 4, 5, 6, 7, 8

Teaching will be delivered in person.

1. Theoretical and practical classes in which the teaching staff will present the main concepts of the course and solve applied problems and activities designed to reinforce the content covered.
2. Classes will be complemented by students' independent work through the completion, submission, and presentation of activities and/or practical cases developed by students individually or in working groups.
3. Tutorials: a number of weekly hours will be set aside to meet students individually, provide academic support, and address any questions they may have.

Note: 15 minutes of one class will be set aside within the calendar established by the faculty or degree programme for students to complete surveys evaluating the teaching performance and the course/module.

Use of AI

In this course, the use of artificial intelligence (AI) technologies is permitted only as a support tool, for example, for searching for information, reviewing the language of texts, or clarifying ideas, unless the teaching staff expressly indicates otherwise for a specific activity.

Students may not use AI tools to generate complete answers, write entire sections of assignments, or answer exam questions. Any content produced wholly or partially with the support of AI must be clearly identified. Students must also specify which tools they have used and include a critical reflection on how their use has

influenced the preparation process and the final outcome of the activity.

Lack of transparency in the use of AI tools will be considered a breach of academic integrity and may result in a partial or total penalty in the grade for the activity, as well as other measures or sanctions in more serious cases.

Annotation: within the schedule set by the centre or degree programme, 15 minutes of one class will be reserved for students to evaluate their lecturers and their courses or modules through questionnaires.

Assessment

Continuous assessment activities

Title	Weight	Hours	ECTS	Learning outcomes
Final exam	50%	2	0.08	1, 2, 3, 4, 5, 6, 7, 8
Course follow-up	15%	0	0	1, 2, 3, 4, 5, 6, 7, 8
Midterm exam	35%	1.5	0.06	1, 2, 3, 4, 5, 6, 7, 8

Comprehensive assessment

This subject/module does not offer the option for comprehensive evaluation.

Continuous assessment

The assessment of the course will be based on the following criteria:

1. Course follow-up: class participation, completion of practical exercises, and ongoing engagement with the course (15% of the final grade).
2. Midterm exam (not exempting and 35% of the final grade).
3. Final exam (50% of the final grade), covering all course content. A minimum score of 4 on the final exam is required to pass the course.

Additional information:

- To pass the course, students must obtain a final mark of 5 or higher and a minimum of 4/10 on the final exam.
- If the final mark is below 3.5, the student must retake the course in the following academic year. The final grade recorded will be the one obtained.
- Students who obtain a final mark equal to or above 3.5 but below 5, or those who obtain a final mark equal to or above 5 but score below 4/10 in the final exam, will be allowed to take the resit exam. The teaching staff will decide the format of the resit, which will be the same for all students.
- If the resit exam grade is 5 or higher, the final course grade will be "PASS" with a maximum numerical

score of 5. If the resit grade is below 5, the final course grade will be "FAIL" with a numerical score of 3.5 (regardless of the score obtained in the resit).

- The student will receive a final grade of "Not assessable" if they have not participated in any of the evaluation activities.

Resit process

"To participate in the resit process, students must have been previously assessed in activities representing at least two-thirds of the final grade for the course or module." (Article 112 ter, section 3, UAB Academic Regulations). Students must also have obtained a final grade between 3.5 and 5.

The resit exam date will be included in the faculty's official exam calendar. Students passing the resit will receive a final grade of 5. Otherwise, they will retain their final exam grade.

Assessment calendar

The dates of all assessment activities (midterms, in-class exercises, project deadlines, etc.) will be announced well in advance during the semester.

The final exam date is published in the Faculty's official exam calendar.

IMPORTANT: "The schedule for assessment activities cannot be modified unless there is an exceptional, well-justified reason. In such cases, the program coordinators, in consultation with the teaching staff and affected students, will propose a new date within the academic term." (Article 115, section 1, UAB Academic Regulations).

Students at the Faculty of Economics and Business who need to reschedule an assessment must submit the request using the [Assessment Rescheduling Form](#).

Review of grades

The publication date and medium of final grades will be announced along with the final exam. Students will also be informed of the procedure, date, time and location for exam reviews in accordance with university regulations.

Irregularities in assessment activities

Without prejudice to any disciplinary measures deemed appropriate and in accordance with current academic regulations: "If a student commits any irregularity that may significantly affect the grade of an assessment activity, this activity will be graded with a 0, regardless of any disciplinary process that may follow. If multiple irregularities occur in the same course, the final course grade will be 0."

(Article 116, section 10, UAB Academic Regulations)

The completion of assessment activities is subject to the provisions set out in this course guide and in the "

Policy of the School of Economics and Business on the Detection of Irregularities during Assessment Activities

", which regulates the conditions under which assessment tasks are conducted and the procedures applicable in cases where indications of irregularities are detected. Students are encouraged to consult the policy.

Bibliography

Basic bibliography

- Hillier, F. and Lieberman, G. (2020): Introduction to Operations Research, 11th ed. McGraw-Hill; chs. 1-5; 9-10 and 12.
- Winston, W.L. (2005): Operations Research: Applications and Algorithms, 4^a ed., Thomson; chs. 1-9.

Further bibliography (latest editions)

- Taha, H (2016): Operations Research: An introduction, 10^a ed., Pearson; chs. 1-5.

Other resources

- Association of European Operational Research Societies (EURO): www.euro-online.org
- International Federation of Operational Research Societies (IFORS): www.ifors.org
- Institute for Operations Research and the Management Sciences (INFORMS): www.informs.org
- The Operations Research Society (Or): www.theorsociety.com
- Sociedad Española de Estadística e Investigación Operativa (SEIO): www.seio.es

Note: Professors can recommend different bibliography in their own groups, in exercise of their academic freedom. Changes will be communicated to students in the first lecture.

Software

LINGO, Excel and others.

Course groups and languages

The information provided is provisional until November 30. After this date, you will be able to consult the language of each group through this [link](#). To access the information, you will need to enter the course CODE

Type of teaching	Group	Language	Semester	Shift
(TE) Theory	2	Spanish	first semester	morning-mixed
(PAUL) Classroom practices	2	Spanish	first semester	morning-mixed
(TE) Theory	4	English	first semester	morning-mixed
(PAUL) Classroom practices	4	English	first semester	morning-mixed
(TE) Theory	52	Spanish	first semester	afternoon
(PAUL) Classroom practices	52	Spanish	first semester	afternoon

(TE) Theory	60	Spanish	first semester	morning-mixed
(PAUL) Classroom practices	60	Spanish	first semester	morning-mixed