

Operations Research I

Code: 102391
ECTS Credits: 6

Degree	Type	Year	Semester
2501572 Business Administration and Management	OB	3	1

Contact

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Use of languages

Principal working language: spanish (spa)
Some groups entirely in English: No
Some groups entirely in Catalan: No
Some groups entirely in Spanish: No

Prerequisites

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

Objectives and Contextualisation

This course is an introduction to Operations Research for students in Business Administration. The course provides basic tools for modeling and to make scientifically based economic decisions. Throughout this course, students are expected to know how to formulate problems as quantitative models that can be solved using algorithmic procedures. Also, students will be able to understand and interpret the results of these procedures.

Skills

- Apply mathematical instruments to synthesise complex economic-business situations.
- Apply theoretical knowledge to improve relations with clients and suppliers, identifying the advantages and disadvantages of those relations for both sides: company and client or supplier.
- Capacity for independent learning in the future, gaining more profound knowledge of previous areas or learning new topics.
- Identify, justify and reason the appropriate decisions according to the basic parameters of a business problem.
- Select and generate the information necessary for each problem, analyse it and take decisions based on that information.
- Take decisions in situations of uncertainty, demonstrating an entrepreneurial and innovative attitude.

Learning outcomes

1. Apply algorithmic resolution techniques to optimisation problems.
2. Apply the basic principles of modelling in business decision-making.
3. Capacity to continue future learning independently, acquiring further knowledge and exploring new areas of knowledge.
4. Differentiate between alternative methods of analysis, and apply the appropriate quantitative tools to resolve business management problems.

5. Make decisions in situations of uncertainty and show an enterprising and innovative spirit.
6. Select and generate the information needed for each problem, analyse it and make decisions based on this information.
7. Solve problems optimising and obtaining forecasts through information technology applications.
8. Use forecasting techniques in business contexts.

Content

CONTENTS

PART I

INTRODUCTION TO LINEAR PROGRAMMING

- 1.1 Introduction to Operations Research: principles and methods
- 1.2 Fundamentals of Mathematical Programming. Continuous linear problems: the simplex algorithm. Sensitivity Analysis. Duality
- 1.3 The transportation problem. Assignment and matching problems. Integer problems
- 1.4 Software for the resolution of mathematical programming problems by numerical methods

PART II

INTRODUCTION TO GRAPH THEORY AND NETWORK FLOWS

- 2.1 Fundamentals and basic concepts. Paths, circuits, chains, cycles, trees, forests and networks
- 2.2 Optimal spanning trees
- 2.3 Optimal paths in a network. Maximum flows. Analysis of social networks
- 2.4 Software for the resolution of network optimization problems by numerical methods

Methodology

1. Theoretical lectures.
2. Practice classes: modeling and solving problems and learn algorithmic techniques.
3. Individual study based on the material developed in the lectures and in the complementary references.

Activities

Title	Hours	ECTS	Learning outcomes
Type: Directed			
Problem solving classes	16.67	0.67	2, 1, 3, 4, 5, 7, 6
Theory classes	33.33	1.33	2, 1, 3, 4, 7, 6
Type: Supervised			

Supervised	4	0.16	2, 1, 3, 4, 5, 7, 6
Type: Autonomous			
Autonomous	90	3.6	2, 1, 3, 4, 5, 7, 6, 8

Evaluation

Evaluation criteria

The evaluation criteria established are conditioned by the penalty system imposed by the new [Model of Academic Dedication](#) (article 9.2) approved by the Governing Council on December 13th, 2017 and by [article 112bis of UAB Academic Regulations](#) approved by Governing Council on July 12th, 2017.

1. Continuous assessment

1. Submission of a practical project done individually and/or in groups of 2-4 students to be handed in at the end of the course: 10% of the final course grade
2. Midterm exam (this exam do not exclude contents from the final exam): 40% of the final course grade.
3. Final exam: 50% of the final course grade.

2 Retake Process

"To be eligible to participate in the retake process, it is required for students to have been previously been evaluated for at least two thirds of the total evaluation activities of the subject." Section 3 of Article 112 ter. The recovery (UAB Academic Regulations). Additionally, it is required that the student to have achieved an average grade of the subject between 3.5 and 4.9.

The date of the retake exam will be posted in the calendar of evaluation activities of the Faculty. Students who take this exam and pass, will get a grade of 5 for the subject. If the student does not pass the retake, the grade will remain unchanged, and hence, student will fail the course.

3. Calendar of evaluation

"The dates of the evaluation activities (midterm exams, exercises in the classroom, assignments, ...) will be announced well in advance during the semester. The date of the final exam is scheduled in the assessment calendar of the Faculty.

The dates of evaluation activities cannot be modified, unless there is an exceptional and duly justified reason why an evaluation activity cannot be carried out. In this case, the degree coordinator will contact both the teaching staff and the affected student, and a new date will be scheduled within the same academic period to make up for the missed evaluation activity. Section 1 of Article 115. Calendar of evaluation activities (Academic Regulations UAB). Students of the Faculty of Economics and Business, who in accordance with the previous paragraph need to change an evaluation activity date must process the request by filling out an Application for exams' reschedule https://eformularis.uab.cat/group/deganat_feie/application-for-exams-reschedule"

4. Grade revision process

"After all grading activities have ended, students will be informed of the date and way in which the course grades will be published. Students will be also be informed of the procedure, place, date and time of grade revision following University regulations."

5. Irregularities in evaluation activities

"In spite of other disciplinary measures deemed appropriate, and in accordance with current academic regulations, "in the case that the student makes any irregularity that could lead to a significant variation in the

grade of an evaluation activity, it will be graded with a 0, regardless of the disciplinary process that can be instructed. In case of various irregularities occur in the evaluation of the same subject, the final grade of this subject will be 0". **Section 10 of Article 116. Results of the evaluation. (UAB Academic Regulations).**"

Evaluation activities

Title	Weighting	Hours	ECTS	Learning outcomes
Final exam	50%	1	0.04	2, 1, 3, 4, 5, 7, 6
Midterm exam	40%	1	0.04	2, 1, 3, 4, 5, 7, 6, 8
Practical project	10%	4	0.16	2, 1, 3, 4, 5, 7, 6, 8

Bibliography

Bibliography

Bazaraa, M.; Jarvis, J. and Sherali, H. (2009): Linear Programming and Network Flows 4th ed. Wiley.

Hillier, F. and Lieberman, G. (2014): Introduction to Operations Research, 10th ed. McGraw-Hill.

Newman, M. (2018): Networks: An Introduction, 2nd ed. Oxford University Press.

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