Operations Research

Code: 104685
ECTS Credits: 6

Degree	Type	Year	Semester
2501572 Business Administration and Management	OB	3	1
2501573 Economics	OT	3	2
2501573 Economics	OT	4	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

Other comments on languages

Main working language: group 4 english; groups 2, 13, 52 ,60 spanish.

External teachers

Pendent. Grup 4

Sanguinetti, Claudia. Grup 2.

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.

Competences

Business Administration and Management
- 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.
- Use of the available information technology and adaptation to new technological environments.

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 available information technology and be able to adapt to new technological settings.

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.

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.

SARS-CoV-2 (COVID-19)

The proposed teaching methodology may undergo some modifications according to the restrictions imposed by the health authorities on on-campus courses.

If public health restrictions do not allow face-to-face teaching or it cannot be done with 100% capacity, the procedure that would be followed in the subject would be the same as that used in the 2020-2021 year.

(*) The teaching staff of the subject is not obliged to allocate part of any class to carry out surveys. The note below is not the authorship of the teaching staff.

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.

Activities

Title	Hours	ECTS	Learning Outcomes
Type: Directed			
Problem solving classes	17	0.68	
Theory classes	32.5	1.3	
Type: Supervised			
Supervised	6.5	0.26	
Type: Autonomous			
Autonomous	90	3.6	

Assessment

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.

A student is considered as "*Not evaluable*" for the overall grade whenever she/he did not participate to any evaluable activity

1. Continous assessment

1. Submission of a practical project done in groups of 2-5 students to deliver in pdf format to the teacher's e-mail address. Deadline: December 13, 2022. 40% of the final course grade.

2. Evaluative test (do not exclude contents from the final exam): 10% 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 forstudents to have been previously beenevaluated 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 equal to or greater than 3.5 and less than 5.*

The date of the retake exam will be posted inthe calendar of evaluation activitiesof 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). Studentsof theFaculty of Economics and Business,who in accordancewith 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/nou-reprogramació-de-proves

4. Grade revision process

"After all grading activities have ended, students will be informed of the date and way in which the course grades willbe 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 appropiate, and in accordance with current academic regulations, *"in the case taht the student makes any irrregulatiry 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 thah 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).

Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes
Evaluative test	10%	0.5	0.02	2, 1, 3, 4, 5, 7, 6, 8
Final exam	50%	2	0.08	2, 1, 3, 4, 5, 7, 6, 8
Practical project	40%	1.5	0.06	2, 1, 3, 4, 5, 7, 6, 8

Bibliography

Basic bibliography

Pujolar, D. (2022): http://rt003ydd.byethost33.com

Further reading (latest editions)

Bazaraa, M.; Jarvis, J. and Sherali, H. (2010): Linear Programming and Network Flows 4th ed. Wiley; chs. 1-4; 10 and 12.

Hillier, F. and Lieberman, G. (2020): Introduction to Operations Research, 11th ed. McGraw-Hill; chs. 1-5; 9-10 and 12.

Newman, M. (2018): Networks: An Introduction, 2nd ed. Oxford University Press; chs. 1-6; 9-10.

Schrage, L. (2006): Optimization Modeling with LINGO, 6th ed. LINDO Systems Inc; chs. 1-2 and 5.

Wilson, R. J. (2010): Introduction to Graph Theory. 5th ed. Thomson; chs. 1 and 3.

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.

Software

LINGO and others.