Universitat Pompeu Fabra Barcelona

Academic Year: 2025/26

21959 - Operations Research

Teaching Guide Information

Academic Course: 2025/26

Academic Center: 304 - Faculty of Law and Economics
332 - Faculty of Economic and Business Sciences

Study: 3041 - Double bachelor's degree programme in Law and Business Management and Administration / Economics
3324 - Bachelor's degree in Business Management and Administration

Subject: 21959 - Operations Research

Credits: 5.0

Course: 418 - Bachelor's degree in Economics: 4
412 - Bachelor's degree in Business Sciences: 4
418 - Bachelor's degree in Economics: 3
412 - Bachelor's degree in Business Sciences: 3
417 - Bachelor's degree in Business Management and Administration: 3
417 - Bachelor's degree in Business Management and Administration: 4
523 - Double bachelor's degree programme in Law and Business Management and Administration / Economics: 6

Teaching languages:

Theory:	Group 1: English
	Group 6: English
Seminar:	Group 101: Pending
	Group 102: Pending
	Group 601: Pending
	Group 602: Pending

Teachers: Daniel Serra de la Figuera

Teaching Period: First term

Presentation

The area of quantitative methods for decision making uses the scientific method as the basis to research and help make decisions on complex problems of the organizations. The purpose of this course is to equip the participants with the relevant tools and techniques for applications in solving managerial problems. The focus of this course will be on applications of quantitative methods in business situations.

The methodology of the course is based on what is known as Operations Research, a science that offer to the decision maker different quantitative methodologies in order to make decisions. The objective of the course is to learn the fundamental concepts, the quantitative models, up to date solution techniques in problem solving and complex decision making. During the course we will see how to apply these techniques in different areas of an organization, such as marketing, production and operations, logistics, finance, etc. Emphasis will be made on practical and real world applications. Excel spreadsheet together with the module "Solver" will be intensively used.

Associated skills | General learning outcomes

Basic Mathematics and Statistics

Learning outcomes | Specific learning outcomes

The objective of the course is to provide the fundamental concepts, quantitative models, solution methods and up to date techniques in decision making.

General competences	Specific competences
Instrumentals • Organization and planning capacities. • Knowledge of software. • Problem solving. • Information search and processing Interpersonals • Oral communication in public. • Team work. • capacity to write technical reports. Systematics • Critical reasoning skills in both reading and writing communication. • Good analysis of qualitative and quantitative information. • Adaptation yo new situations and environments.	Academic and professionals • Recognize the relevance of quantitative methods in decision making within management organizations. • To be able to know when these tools can be used, and in which environments, and when not to use them. • To learn how to apply these tools and methodologies of quantitative methods in managerial problems. • To be able to use information system technologies and optimization software as a support for complex decision making situations. • To develop the understanding of the results obtained and how to implement them in “real world” situations

Contents

1. Introduction to modelling and decision making
2. Linear Programming:
   - 2.1. Structure of the problem.
   - 2.2. Mathematical conditions.
   - 2.3. Objectives and constraints.
   - 2.4. Examples of formulations: human resources problems, capacity problems, transportation problems.
3. Solution methods in LP
   - 3.1. Graphical method
   - 3.2. The simplex algorithm
   - 3.3. Solver and other software.
   - 3.4. Heuristic methods
4. Multiobjective programming
   - 4.1. Objective space.
   - 4.2. Efficiency in solutions
   - 4.3. The weighting method and constraint methods. Case studies.
   - 4.4. Goal programming.
5. Integer programming

5.1. Problem formulation.
5.2. The branch and bound procedure.
5.3. The knapsack problem.
5.4. Assignment problems.

6. Network Models
   6.1. Network notation
   6.2. Minimum spanning tree
   6.3. Maximal flow
   6.4. Shortest Path
   6.5. Location problems

7. Project Management
   7.1. Critical Path Model
   7.2. PERT
   7.3. PERT/CMP
   7.4. PERT/cost
   7.5. Case study

Evaluation and grading system

NOTA: L'assignació docent d'aquesta assignatura està pendent, per tant tot i que la descripció de l'assignatura no variarà, altres aspectes d'aquest PDA poden canviar un cop acabada l'assignació docent.

La asignación docente de esta asignatura está pendiente, por ello aunque la descripción de la misma no variará, si pueden hacerlo otros aspectos de este PDA.

NOTE: The teaching assignment for this course is pending, therefore, even if the course description will not change, other aspects of this syllabus may be different once the teaching assignment has been finalized.

- Final exam: 60% of the grade. You need to obtain in this exam at least a grade of 4 out of 10 to pass the course.
- Continuous evaluation: 40% of the grade:
  - 20% homeworks and case studies
  - 20% On-line tests
- Attendance to face-to-face sessions, tests and homework submissions are compulsory.
- The retake of the exam counts also 60% of the grade. You need to obtain in this exam at least 4 out of 10 to pass the course.