Course guide  
240755 - 240755 - Operations Research  

Unit in charge: Barcelona School of Industrial Engineering  
Teaching unit: 1039 - UPF - Universitat Pompeu Fabra.  
Degree: BACHELOR’S DEGREE IN INDUSTRIAL TECHNOLOGIES AND ECONOMIC ANALYSIS (Syllabus 2018). (Compulsory subject).  
Academic year: 2023  
ECTS Credits: 4.5  
Languages: English  

LECTURER  
Coordinating lecturer: Daniel Serra de la Figuera  
Others:  

PRIOR SKILLS  
Basic Mathematics and statistics  

TEACHING METHODOLOGY  
- Face-to-face sessions  
- Activities including readings, power point slides, and other materials, Please read materials before the sessions.  
- Homeworks  
- Tests
LEARNING OBJECTIVES OF THE SUBJECT

General:

Instrumentals
Organization and planning capacities.
Knowledge of software.
Problem solving.
Information search and processing

Interpersonal
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.

Specific:

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 |
| Description: |
| Introduction to modelling and decision making |
| **Full-or-part-time:** 1h 30m |
| Theory classes: 1h 30m |

| 2. Linear Programming |
| Description: |
| 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. |
| **Full-or-part-time:** 9h |
| Theory classes: 9h |
3. Solution methods in LP

Description:
3.1. Graphical method
3.2. The simplex algorithm
3.3. Solver and other software.
3.4. Heuristic methods

Full-or-part-time: 9h
Theory classes: 9h

4. Multiobjective programming

Description:
4.1. Objective space
4.2. Efficiency in solutions
4.3. The weighting method and constraint methods. Case studies.
4.4. Goal programming

Full-or-part-time: 5h
Theory classes: 5h

5. Integer programming

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

Full-or-part-time: 5h
Theory classes: 5h

6. Network Models

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

Full-or-part-time: 5h
Theory classes: 5h
7. Project Management

Description:
7.1. Critical Path Model
7.2. PERT
7.3. PERT/CMP
7.4. PERT/cost
7.5. Case study

Full-or-part-time: 4h 30m
Theory classes: 4h 30m

GRADING SYSTEM

Final exam: 60% of the grade.
Continuous evaluation: 40% of the grade:
25% homeworks and case studies
15% tests

BIBLIOGRAPHY

Basic: