Universidad Zaragoza

Year : 2019/20

30634 - Operative Research

Syllabus Information

Academic Year: 2019/20
Subject: 30634 - Operative Research
Faculty / School: 109 - Facultad de Economía y Empresa
Degree: 432 - Joint Law - Business Administration and Management Programme
ECTS: 5.0
Year: 6
Semester: First semester
Subject Type: Optional
Module: ---

1.General information

1.1.Aims of the course

The course is oriented to decision support and contributes, according to the evolutionary paradigms, in three key aspects of the student's training (3Ps): (i) it helps to make a decision (product); (ii) it enhances understanding of the decisional process (process) and, most important, (iii) it supports the integral formation of individuals (people) and the improvement of the systems in which they are immersed, providing them with a set of skills and attitudes to address the scientific resolution of any problem, even problems that do not arise in the economic context.

Taught in the last year of the degree, it has an instrumental and professional contribution. It presents the methods, models and techniques most commonly used in the scientific solving of business problems and introduces the computer systems used as decision support. In short, it seeks to provide scientific rigour in all stages of the decision-making process using decisional tools.

1.2.Context and importance of this course in the degree

Because of its location (4th year) and content, the orientation given to the subject is eminently practical. As it combines the formative with the informative and the rational with the emotional, it will be taught in the computer room, where students will work in teams. Learning by rote and mechanical calculation effort will be avoided, enhancing teamwork, creativity, the use of the computer and the application of the techniques developed in class to real situations.

Operations Research acts as a link between theoretical modelling and practical implementation (mental --> structural --> formal --> resolution models). It also presents a series of optimization (uni- and multi-criteria) and simulation tools that are essential in solving problems in the different functional areas of the company and very appropriate for the development of degree dissertation, an aspect that will be addressed within the course.

1.3.Recommendations to take this course

This course, focused on solving complex scientific problems in the economic and business environment, has an eminently participatory and practical orientation, without any mnemonic requirement. The course aims to apply different decisional tools (analytical and computer) to the scientific resolution of a case study, as real as possible, selected by the student. This case may be closely related to the grade dissertation. No specific previous knowledge is required, apart from that acquired in the degree.

2.Learning goals

2.1.Competences

1. **Specific Competences**:

E1.- Assessing the situation and the foreseeable development of companies and organizations, making decisions and drawing on the relevant knowledge with reference to social responsibility.

E2.- Understanding and applying professional standards and scientific rigour to the resolution of the economic, business and organizational problems.

E3.- Developing and drafting projects.

Cross competences:

T1.- Ability to solve problems.

T2.- Organizational and planning skills.

T3.- Ability to seek and analyse information from different sources.

T4.- Ability to make decisions.

T5.- Motivation for quality and excellence.

T6.- Adaptability to new situations.

T7.- Ability to apply knowledge in practice.

T8.- Ability to use technological tools necessary in the students' professional development.

2.2.Learning goals

Passing this course will enable the student to...

- Know the different scientific approaches followed throughout history to address the scientific resolution of economic and business problems.
- Know the new challenges and needs posed by scientific decision making in the so-called Knowledge Society.
- Handle common decisional tools with a cognitive orientation, in line with the holistic view of the real world.
- Keep abreast of the new scientific (multi-criteria) approaches followed in solving complex problems characterized by the existence of multiple scenarios, actors and criteria (both tangible and intangible).
- Be able to integrate into the decision-making process the objective, the rational and the tangible associated with traditional science together with the subjective, the emotional and the intangible associated with the human factor.
- In short, to be able to provide scientific rigour in resolving any decisional problem.

2.3.Importance of learning goals

The cognitive orientation given to the exploitation of the mathematical models used in the subject contributes, as mentioned above, to the 3Ps (Product, Process and People), that is, it helps the student to: (i) make timely decisions; (ii) better understand the decisional processes; and (iii) train people in one of the main aspects in the Knowledge Society: the decision-making. This training is not limited to skills (methods, models and techniques) but focuses on attitudes (skills, habits and qualities) when addressing decision-making in complex situations. Training in these kinds of intangible and emotional aspects is essential from the professional and human point of view, the latter being essential in the Knowledge Society.

3.Assessment (1st and 2nd call)

3.1.Assessment tasks (description of tasks, marking system and assessment criteria)

The student will demonstrate the achievement of the desired learning outcomes through the following assessment activities.

- **Global assessment** in both official announcements, consisting of two parts:

1. **Part I (uni-criterion)**: individual computer test on the use of the decisional tools seen in the classroom, corresponding to the single criteria optimization, in case brought by the teacher (50% of the final grade). The test will consist of two exercises in the same or different days. The first (20% of the final grade), corresponding to units 1 and 2) will address the interpretation of the outputs of the software used in class. The second (30%), corresponding to units 3, 4 and 5, will focus on modelling and solving problems of transport and logistics.
2. **Part 2 (multicriteria)**: presentation and defense of a project developed in small groups in which the decisional tools tought in the classroom corresponding to the multi-criteria optimization and heuristic methods, will be applied to a problem as real as possible, selected by the student (50% of the grade). The End of Course projects selected by the students can address some parts of the Degree Thesis that students must submit. To take advantage of the synergies of teamwork it will be favored that the individual works be part of a group project that the students can defend collectively. The evaluation criteria will take into account the following issues: (i) Topicality and relevance of the selected theme (up 15 points); (ii) Modelling (up 15 points); (iii) Resolution (up 15 points); (iv) Use of the computer tools (up 15 points); (v) Exploitaiton and Learning (up 20 points) and (vi) formal aspects and defense (until formal 20 points).

2: Evaluation criteria

To pass the course the student must obtain at least a score of 5 out of 10, adding the two parts

4.Methodology, learning tasks, syllabus and resources

4.1.Methodological overview

As Operations Research has an eminently practical orientation, the presentation of the contents will take place in the computer room following an instrumental orientation. In parallel, the exploitation with cognitive purposes of the decisional tools studied in the classroom will be held in a narrative way, using unstructured methods (lateral thinking, group discussion...) for enhancing creativity and emotional skills. When possible, individual works will be grouped in a collaborative or multi-actor context, to train the students in the group decision-making process.

4.2.Learning tasks

Apart from the regular lectures in the computer room (decisional tools), the students' training will be complemented by lectures and seminars that will be communicated in due course. Also, a collaborative tool for discussion and debate on the more relevant economic and business issues will be enabled.

4.3.Syllabus

Unit 0 : Preface

- 0.1 Presentation
- 0.2 Principal objectives and approach
- 0.3 Programme
- 0.4 Assessment

Unit 1: Foundations of Decision Making

- 1.1 Decision Making Problem

- 1.2 Decision Making Process. Descriptive models.
- 1.3 Basic concepts
- 1.4 Structured and non-structured techniques.

Unit 2: Linear Programming

- 2.1 Linear models
- 2.2 Simplex method
- 2.3 Post-optimal analysis
- 2.4 Software and applications

Unit 3: Transport and Distribution

- 3.1 Transport models. Algorithms.
- 3.2 Transhipment model and Assignment model
- 3.3 Post-optimal analysis
- 3.4 Software and applications

Unit 4: Integer Programming

- 4.1 Introduction.
- 4.2 Integer models. Algorithms.
- 4.3 Case studies.
- 4.4 Software and applications

Unit 5: Simulation.

- 5.1 Introduction
- 5.2 Random numbers and random variables
- 5.3 Simulation design and statistical analysis
- 5.4 Simulation in Decision Making
- 5.5 Software and applications

Unit 6: Multicriteria Decision Making. Multiobjective Programming.

- 6.1 Introduction
- 6.2 Pareto optimal solutions
- 6.3 Compromise programming
- 6.4 Goal programming
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- 6.5 Software and applications

Unit 7: Multicriteria Decision Making. Multiattribute Programming.

- 7.1 Discrete Multicriteria Decision making
- 7.2 Multiattribute Utility Theory (MAUT)
- 7.3 Analytic Hierarchy Process (AHP) and Analytic Network Process (ANP)
- 7.4 Outranking methods: ELECTRE and Promethee methods
- 7.5 Software and applications

4.4.Course planning and calendar

Week 1: Introduction and Fundamentals of decision making [4

hours] Weeks 2 and 3: Linear Programming [8 hours]

Weeks 4 and 5: Distribution and Transport [8 hours]

Week 6 and 7: Integer programming, Simulation and Computer Test

(uniobjective optimization) [8 hours]

Weeks 8 to 12: Multicriteria Decision Making [16 hours]

Weeks 13 to 15: Practical projects (multicriteria decision making) [6 hours]

Key activities and dates will be communicated through the appropriate means at the beginning of the course. The dates of the final exams will be available on the website of the various faculties where the degree is taught.

4.5.Bibliography and recommended resources