TECHNICAL SHEET OF THE SUBJECT

Data of the subject	
Subject name	Operations Research
Subject code	E000009396
Mainprogram	Grado en Análisis de Negocios/Business Analytics
Involved programs	Grado en Análisis de Negocios/Business Analytics y Grado en Derecho [Fourth year] Grado en Administración y Dirección de Empresas y Grado en Análisis de Negocios/Business Analytics [Third year]
Quarter	Semestral
Credits	6,0 ECTS
Type	Compulsory
Department	Departamento de Métodos Cuantitativos
Coordinator	Dr C Alejandro Betancourt Odio

Teacher Information	
Teacher	
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SPECIFIC DATA OF THE SUBJECT

Contextualization of the subject
Contribution to the professional profile of the degree

The course's main purpose is to provide a deep and broad understanding of instrumental mathematical techniques used for decision-making, a crucial ability for graduates and future professionals in Business Analytics.

Upon completion of this course, students will master the formulation of real-world problems through mathematical programming tools and will learn alternative techniques aimed at solving operations research models. In specific terms, the course is meant to enable students to:

1. Distinguish several fields in which operation management techniques are applied.

2. Model systems suitable for different business sectors through quantitative methods.

3. Understand and apply decision-making methods that influence system behaviour.

4. Analyse and interpret the results obtained through different methods.

5. Outline and solve specific systematic models by using algebraic modelling languages.

6. Analyse and synthetise incoming information and adequately communicate the content of the modelled practice, both in written and oral forms.

7. Enhance problem-solving skills via group projects.

Prerequisites

Basic knowledge of algebra, statistics and calculus.

Competencies - Objectives

Competences

GENERALES

CG02		Capacidad de análisis de datos masivos procedentes de diversas fuentes: texto, audio, numérica e imagen
	RA1	Ser capaz de analizar y sintetizar la información recibida en lenguaje matemático
	RA2	Ser capaz de obtener información de operaciones financieras y, a partir de ella, identificar su estructura.
CG03		Resolución de problemas y toma de decisiones en un entorno de datos masivos tanto cuantitativos como cualitativos
	RA1	Conocer las herramientas matemáticas básicas que les capacite para plantear y resolver los problemas reales planteados en el mundo de la empresa
	RA2	Adquirir la capacidad para la toma de decisiones con conocimiento, iniciativa y espíritu crítico.
CG11		Capacidad para aprender y trabajar autónomamente en la sociedad de la información
	RA1	Ser capaz para aplicar los conocimientos obtenidos en contextos nuevos
	RA2	Ser capaz para aprender nuevos métodos y teorías de forma autónoma en su vida profesional

ESPECÍFICAS

CE17		Adquirir la capacidad para la resolución de los problemas planteados en el entorno empresarial utilizando las herramientas matemáticas

	RA1	Conocer las herramientas básicas de algebra lineal
	RA2	Modelizar en términos del cálculo diferencial e integral situaciones dependientes de varias variables
	RA3	Conocer los modelos matemáticos que permiten analizar y comparar de operaciones financieras ciertas en tiempo discreto
	RA4	Capacidad para valorar críticamente datos y resultados relacionados con las operaciones financieras que formen parte de los modelos de negocio analizados
CE18		Conocer y utilizar las técnicas matemáticas de optimización y decisión para el tratamiento de datos
	RA1	Reconocer los campos en los que se aplican las técnicas de investigación operativa
	RA2	Comprender y aplicar las técnicas utilizadas para la toma de decisiones cuando se posee gran cantidad de información.
	RA3	Analizar e interpretar las soluciones obtenidas

THEMATIC BLOCKS AND CONTENTS

Contents - Thematic Blocks
Topic 1.Introduction to Operations Research (6 hrs)
1. Stages of an Operations Research study. 2. Definition of an optimization problem. 3. Introduction to Optimization models.
Topic 2. Linear, nonlinear and integer models(20 hrs)
1. Assumptions of linear models. 2. Linear models. Graphical representation. Simplex Method. 3. Integer and Mixed models. Graphical representation. Branch and Bound Method. 4. Non-linear models. 5. Modeling and solution in computer by means of GAMS.
Topic 3. Multiobjective models (10 hrs)
1.Multicriteria models. Method of weights. Lexicographic method. 2.Modeling, solution and interpretation using GAMS.
Topic 4. Resource scheduling and optimization (8 hrs).

PERT Method. Project planning. Project management software.

Topic 5. Decision-making criteria (8 hrs)

Criteria in decision making. Decision trees. Rectangular and bipersonal games. Break-even point.

Topic 6. Queuing theory (8 hrs)

1.Elements of a queuing model.

2.Exponential distribution in a queue model.

3.Generalized Poisson queuing model.

4.Models with a server.

5.Modeling and solution on computer using GAMS.

TEACHING METHODOLOGY

General methodological aspects of the subject

SUMMARY STUDENT WORKING HOURS

CLASSROOM HOURS	
Lecciones de Carácter expositivo	Seminarios y talleres
56.00	4.00
NON-PRESENTIAL HOURS	
	ECTS CREDITS: 6,0 (60,00 hours)

EVALUATION AND CRITERIA

Evaluation activities	Evaluation criteria	Weight
Understanding of concepts. Application of concepts to problem solving. Analysis and interpretation of the results obtained.	50%	50
Two mid-term exams (35% of the final grade).	35%	35
Five assignments of optimization	15%	15

Ratings

The final grade of the course in the first call will be calculated as a weighted average of the continuous evaluation and the final exam

according to the following weights:

1. 50% of continuous evaluation divided in two parts:

   a) 15% of five assignments to be announced and displayed on Moodle.

   b) 35% two midterm exams.

   2.50%. Final written exam.

A minimum grade of 4.0 on the Final Exam is required to be considered the continuous evaluation.

A minimum attendance of 80% is mandatory.

In the case of the extraordinary call, the final grade will be the higher of the two following options:

1. Grade obtained between the weighting of the extraordinary grade (50%) and the cumulative grade for the continuous evaluation (50%).
2. Extraordinary exam grade.

Also, a minimum grade of 4.0 on the Extraordinary Exam is required to be considered the continuous evaluation.

BIBLIOGRAPHY AND RESOURCES

Basic Bibliography
F.S. Hillier, G.J. Lieberman Introduction to Operations Research, 9/e. McGraw-Hill Higher Education. 2014.
Betancourt, M.A.(2020). Investigación Operativa. Problemas en Business Analytics. ISBN-13: **9788479915230**