COURSE GUIDE: 2016-17

COURSE DETAILS			
Name :	Quantitative Methods		
Code :	62102205	Plan :	Grade in Administration and Business Management
Academic year :	2016/17	Level :	Undergraduate
Course :	2	Type :	Obligatory
Semester :	2nd		

TIME DISTRIBUTION IN ACCORDANCE WITH REGULATION			
ECTS :	6	In-class hours:	45
		Not in-class hours:	105
		Total time (in hours):	150
USE OF VIRTUAL PLATFORM:		Supporting teaching	

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ACTIVITIES ORGANIZATION		
Planned activities for learning and workload distribution per activity (in hours)		
I. STUDENT'S ACTIVITIES (In-class / Online)	• Seminars	0,0
	• Teaching group	31,0
	• Work group / small group	14,0
	Total In-class/Online time:	45,0
II. STUDENT'S AUTONOMOUS ACTIVITIES (not in-class)	• (Group work, Personal work)	105,0
	Total not in-class time :	105,0
TOTAL WORKING HOURS		150,0

ELEMENTS OF INTEREST FOR COURSE LEARNING
Justification of contents
The goal is that the student knows several mathematical models related with optimization and decision-making. Particularly, different aspects about mathematical programming (linear and non-linear with restrictions), multicriterial optimization and game theory are studied.
Other courses related
Mathematics I (1st course of ABM), Macroeconomics (2th course of ABM), Operations Management I and II (3th course of ABM), Strategic Management I and II (4th course of ABM).
Minimum knowledge required to deal with the Course
Topics corresponding to a basic Mathematics course of the 1st year of Administration and Business Management. General education and B1 level in English are required, B2 level is highly recommended.

COMPETENCIES
General competencies

General objectives of the University of Almería

- Basic professional skills.
- Oral / written communication in English.
- Problem solving skills.

Other general objectives

- Understanding and applied knowledge.

Specific competencies developed

MEC01. Use quantitative tools
MEC02. Be able to modeling business situations
MEC03. Use computer software related with the knowledge of the subject

LEARNING OJECTIVES/OUTCOMES

RD1. The student should have knowledge and understanding in this study area. UAL1. His/her knowledges, skills and attitudes should enable him/her to understand new theories, interpretations, methods and techniques within the different knowledge fields to satisfy professional demands. UAL·. The student should be able to identify, analyse, and define the significate elements in a problem for its resolution with rigor. MECO1. The student should be able to use quantitative tools. MECO2. He or she will be able to pose, solve and read practical situations in his/her professional activity. MECO3. The student will be able to use computer software related to the material of the subject.

CONTENTS			
Module	Module 1: Linear and Integer Programming.		
Content	Unit 1: Introduction to Linear Programming. Some classical optimization problems: transportation problem.		
Learning system and methodology			
System	*Learning procedures and activities*	*Observations*	*Hours In-class/ Online*
Teaching group [example]	Lecture		2,0
Work group [example]	Problem solving		1,0
Description of autonomous workload			

- Attending the lectures and problem solving sessions.
- Active participation in classes.
- Individual study and problem solving.

- Use and consult the recommended bibliography, as well as making use of office hours.
- Use of the resources available at Aula Virtual.

Content	Unit 2: Simplex method. Duality

Learning system and methodology

System	*Learning procedures and activities*	*Observations*	*Hours In-class/ Online*
Teaching group	Lectures		5,0
Work group	Problem solving		2,5

Description of autonomous workload

- Attending the lectures and problem solving sessions.
- Active participation in classes.
- Individual study and problem solving.
- Use and consult the recommended bibliography, as well as making use of office hours.
- Use of the resources available at Aula Virtual.

Content	Unit 3: Integer programming. Branch and bound method

Learning system and methodology

System	*Learning procedures and activities*	*Observations*	*Hours In-class/ Online*
Teaching group	Lectures		2,0
	Assessment session		1,0
Work group	Problem solving		1,0

Description of autonomous workload

- Attending the lectures and problem solving sessions.
- Active participation in classes.
- Individual study and problem solving.
- Use and consult the recommended bibliography, as well as making use of office hours.
- Use of the resources available at Aula Virtual.

Module	Module 2. Non-linear Programming.
Content	Unit 1: Constrained optimization with equality constraints. Lagrange multipliers. Economic interpretation.

Learning system and methodology

System	*Learning procedures and activities*	*Observations*	*Hours In-class/ Online*
Teaching group	Lectures		3,0
Work group	Problem solving		1,0

Description of autonomous workload
• Attending the lectures and problem solving sessions. • Active participation in classes. • Individual study and problem solving. • Use and consult the recommended bibliography, as well as making use of office hours. • Use of the resources available at Aula Virtual.

Content	Unit 2: Constrained optimization with inequality constraints. Theorem of Karush-Kuhn-Tucker.

Learning system and methodology			
System	*Learning procedures and activities*	*Observations*	*Hours In-class/ Online*
Teaching group	Lectures		2,0
	Assessment session		1,0
Work group	Problem solving		1,5

Description of autonomous workload
• Attending the lectures and problem solving sessions. • Active participation in classes. • Individual study and problem solving. • Use and consult the recommended bibliography, as well as making use of office hours. • Use of the resources available at Aula Virtual.

Module	Module 3: Multicriterial optimization.
Content	Unit 1: Multicriterial problems. Pareto-efficient solutions. Graphical solution of problems with two variables and two objective functions.

Learning system and methodology			
System	*Learning procedures and activities*	*Observations*	*Hours In-class/ Online*
Teaching group	Lectures		2,0
Work group	Problem solving		1,0

Description of autonomous workload
• Attending the lectures and problem solving sessions. • Active participation in classes. • Individual study and problem solving. • Use and consult the recommended bibliography, as well as making use of office hours. • Use of the resources available at Aula Virtual.

Content	Unit 2: Goal Programming		
Learning system and methodology			
System	*Learning procedures and activities*	*Observations*	*Hours In-class/ Online*
Teaching group	Lectures		3,0
	Assessment session		1,0
Work group	Problem solving		2,0
Description of autonomous workload			

- Attending the lectures and problem solving sessions.
- Active participation in classes.
- Individual study and problem solving.
- Use and consult the recommended bibliography, as well as making use of office hours.
- Use of the resources available at Aula Virtual.

Module	Module 4: Elements of Game Theory		
Content	Unit 1: Games of two players. Pure and mixes strategies.		
Learning system and methodology			
System	*Learning procedures and activities*	*Observations*	*Hours In-class/ Online*
Teaching group	Lectures		3,0
Description of autonomous workload			

- Attending the lectures and problem solving sessions.
- Active participation in classes.
- Individual study and problem solving.
- Use and consult the recommended bibliography, as well as making use of office hours.
- Use of the resources available at Aula Virtual.

Content	Unit 2: Matrix games and linear programming.		
Learning system and methodology			
System	*Learning procedures and activities*	*Observations*	*Hours In-class/ Online*
Teaching group	Lectures		2,0
	Assessment session		1,0
Work group	Problem solving		2,0
Description of autonomous workload			

- Attending the lectures and problem solving sessions.

- Active participation in classes.
- Individual study and problem solving.
- Use and consult the recommended bibliography, as well as making use of office hours.
- Use of the resources available at Aula Virtual.

Content	Unit 3: Cooperative and non-cooperative games. Shapley value.

Learning system and methodology

System	*Learning procedures and activities*	*Observations*	*Hours In-class/ Online*
Teaching group	Lectures		3,0
Work group	Problem solving		2,0

Description of autonomous workload

- Attending the lectures and problem solving sessions.
- Active participation in classes.
- Individual study and problem solving.
- Use and consult the recommended bibliography, as well as making use of office hours.
- Use of the resources available at Aula Virtual.

EVALUATION SYSTEM

Assessment criteria

In order to pass it is necessary to score at least 5 points from a maximum of 10. The assessment considers two aspects:

1. A written final exam, weighing 60% of the final grade.
2. Continuous evaluation, weighing 40% of the final score, comprised of written tests, independent works completed by the students, participation in class, or any other complementary activity established by the teachers.

The final grade will be a result of adding both grades, being a necessary condition for passing to get at least 2 points from 6 in the final exam.

For the extraordinary final exam in September, the criteria will be the following:

1. A written final exam, weighing 80% of the final grade.
2. Continuous evaluation during the course, weighing 20% of the final score. So the grade in this item will be half the continuous evaluation mark obtained in June.

Marking system

	Activity	*(Number of hours)*	*Percentage*
I. STUDENT 'S ACTIVITIES (In-class/Online)	• Teaching group	31	30%

	• Work group/ small group	14	30%
II. STUDENT'S AUTONOMOUS ACTIVITIES (Autonomous work)	• Individual work	105	40%

Assessment instruments

- Test, quizzes, exercises, problem sets.
- Final evaluation of reports, essays, projects, etc.
- Final exams (written or oral).

Monitoring mechanisms

- Registration and access to "Aula Virtual"
- Completion of in-class quizzes and problem solving sessions
- Solution of additional problems and their defense during office hours

BIBLIOGRAPHY

Recommended bibliography

Basic:

- Decisiones multicriterio: fundamentos teóricos y utilización práctica (Barba-Romero, S.) – Basic bibliography
- Introducción a la investigación de operaciones *(Hillier, F.L. y Lieberman, G.L.)* - Basic bibliography
- Linear programming and economic analysis (*Dorfman, R., Samuelson, P.A., Solow, R.M.*) - Basic bibliography
- Optimización: cuestiones, ejercicios y aplicaciones a la economía (*Barbolla, R., Cerdá, E. y Sanz, P.*) - Basic bibliography
- Programación lineal y no lineal *(Luenberger, D.E.)* - Basic bibliography
- Programación matemática *(Balbás de la Corte, Alejandro)* - Basic bibliography
- Teoría de juegos (*Pérez Navarro, J., Jimeno Pastor, J.L., Cerdá Tena, E.*) – Basic bibliography
- Teoría de juegos con aplicaciones a la economía *(Friedman, James W.)* - Basic bibliography

Complementary:

- Aplicaciones de Álgebra Lineal *(Grossman, S.I.)* – Complemetary bibliography
- Matemáticas II. Economía y Empresa. Teoría. *(Rodríguez, J., Prieto, E., Hernández, V. y Gómez, P.)* - Complemetary bibliography

Bibliography existing in the library of the University of Almeria

http://almirez.ual.es/search/x?SEARCH=70534211

WEB ADRESSES
http://home.ubalt.edu/ntsbarsh/opre640a/partVIII.htm *Deterministic Modeling: Linear Optimization with Applications* http://home.ubalt.edu/ntsbarsh/Business-stat/opre/PartIII.htm *Integer Optimization and the Network Models* http://home.ubalt.edu/ntsbarsh/Business-stat/opre/partIV.htm *The Classical Simplex Method* http://home.ubalt.edu/ntsbarsh/Business-stat/opre/partVI.htm *Introduction to Game Theory: Wining Business in A Competitive Environment* http://home.ubalt.edu/ntsbarsh/Business-stat/opre/nonlinear.htm *From Linear to Nonlinear Optimization with Business Applications* http://www.gambit-project.org/ *Freeware with tools of Game Theory* http://www.phpsimplex.com/ *Online tool for solving linear programming problems.*