

**COURSE GUIDE: 2015-16**

<b>COURSE DETAILS</b>			
Name :	<b>Quantitative Methods</b>		
Code :	<b>62102205</b>	Plan :	<b>Grade in Administration and Business Management</b>
Academic year :	2014/2015	Level :	<b>Undergraduate</b>
Course :	2	Type :	<b>Obligatory</b>
Semester :	2nd		

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

<b>LECTURER DETAILS</b>			
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Name	Castaño Fernández, Ana Belén		
Department	Mathematics		

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

<b>ELEMENTS OF INTEREST FOR COURSE LEARNING</b>
<b>Justification of contents</b>
Several mathematical models related with optimization and decision making are introduced. In particular, fundamentals of mathematical programming (both linear and non-linear, with constraints) and of the game theory are studied.
<b>Other courses related</b>
Mathematics I (1 <sup>st</sup> 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).
<b>Minimum knowledge required to deal with the Course</b>
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.

<b>COMPETENCIES</b>
<b>General competencies</b>
<i>General objectives of the University of Almería</i>
<ul style="list-style-type: none"> <li>• Basic professional skills.</li> </ul>

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<ul style="list-style-type: none"> <li>• Oral / written communication in English.</li> <li>• Capacity of self-criticism.</li> <li>• Problem solving skills.</li> </ul>
<p><i>Other general objectives</i></p> <ul style="list-style-type: none"> <li>• Understanding knowledge.</li> <li>• Application of knowledge.</li> <li>• Learning to learn.</li> </ul>
<p>Specific competencies developed</p> <p>Ability of using tools of quantitative nature. Be able to model business situations Using computer applications related with the contents of the units.</p>
<p><b>LEARNING OBJECTIVES/OUTCOMES</b></p> <ol style="list-style-type: none"> <li>1. Acquiring fundamentals of mathematical modeling in real-life situations.</li> <li>2. Being able to pose and solve optimization problems appearing in economics and business, distinguishing between linear and non-linear models, and applying adequate solution methods.</li> <li>3. Being able to use basic concepts of the game theory in the social and economic context.</li> </ol>

<b>ORGANIZATION OF MODULES AND UNITS</b>			
<b>Module</b>	Module 1: Linear and Integer Programming.		
<b>Content/Unit</b>			
	Unit 1: Introduction to Linear Programming. Some classical optimization problems: transportation problem.		
<b>Learning system and methodology</b>			
<i>System</i>	<i>Learning procedures and activities</i>	<i>Observations</i>	<i>Hours In-class/ Online</i>
Teaching group	Lectures		2,0
Work group	Problem solving		1,0
<b>Description of autonomous workload</b>			
<ul style="list-style-type: none"> <li>• Attending the lectures and problem solving sessions.</li> <li>• Active participation in classes.</li> <li>• Individual study and problem solving.</li> <li>• Use and consult the recommended bibliography, as well as making use of office hours.</li> <li>• Use of the resources available at Aula Virtual.</li> </ul>			
<b>Content/Unit</b>			
	Unit 2: Simplex method.		

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<b>Learning system and methodology</b>			
<i>System</i>	<i>Learning procedures and activities</i>	<i>Observations</i>	<i>Hours In-class/ Online</i>
Teaching group	Lectures		3,0
Work group	Problem solving		1,5
<b>Description of autonomous workload</b>			
<ul style="list-style-type: none"> <li>• Attending the lectures and problem solving sessions.</li> <li>• Active participation in classes.</li> <li>• Individual study and problem solving.</li> <li>• Use and consult the recommended bibliography, as well as making use of office hours.</li> <li>• Use of the resources available at Aula Virtual.</li> </ul>			
<b>Content/Unit</b>			
Unit 3: Duality. Dual simplex method.			
<b>Learning system and methodology</b>			
<i>System</i>	<i>Learning procedures and activities</i>	<i>Observations</i>	<i>Hours In-class/ Online</i>
Teaching group	Lectures		2,0
Work group	Problem solving		1,0
<b>Description of autonomous workload</b>			
<ul style="list-style-type: none"> <li>• Attending the lectures and problem solving sessions.</li> <li>• Active participation in classes.</li> <li>• Individual study and problem solving.</li> <li>• Use and consult the recommended bibliography, as well as making use of office hours.</li> <li>• Use of the resources available at Aula Virtual.</li> </ul>			
<b>Content/Unit</b>			
Unit 4: Integer Programming. Branch and Bound method.			
<b>Learning system and methodology</b>			
<i>System</i>	<i>Learning procedures and activities</i>	<i>Observations</i>	<i>Hours In-class/ Online</i>
Teaching group	Lectures		2,0
	Tests and quizzes		1,0
Work group	Problem solving		1,0
<b>Description of autonomous workload</b>			
<b>Module</b>	Module 2: Non-linear Programming.		
<b>Content/Unit</b>			

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	Unit 1: Constrained optimization with equality constraints. Lagrange multipliers. Economics interpretation.		
<b>Learning system and methodology</b>			
<i>System</i>	<i>Learning procedures and activities</i>	<i>Observations</i>	<i>Hours In-class/ Online</i>
Teaching group	Lectures		3,0
Work group	Problem solving		1,5
<b>Description of autonomous workload</b>			
<ul style="list-style-type: none"> <li>• Attending the lectures and problem solving sessions.</li> <li>• Active participation in classes.</li> <li>• Individual study and problem solving.</li> <li>• Use and consult the recommended bibliography, as well as making use of office hours.</li> <li>• Use of the resources available at Aula Virtual.</li> </ul>			
<b>Content/Unit</b>			
	Unit 2: Constrained optimization with inequality constraints. Theorem of Karush-Kuhn-Tucker.		
<b>Learning system and methodology</b>			
<i>System</i>	<i>Learning procedures and activities</i>	<i>Observations</i>	<i>Hours In-class/ Online</i>
Teaching group	Lectures		2,0
	Tests and quizzes		1,0
Work group	Problem solving		1,0
<b>Description of autonomous workload</b>			
<b>Module</b>	Module 3: Elements of Game Theory.		
<b>Content/Unit</b>			
	Unit 1: Games of two participants. Pure and mixed strategies.		
<b>Learning system and methodology</b>			
<i>System</i>	<i>Learning procedures and activities</i>	<i>Observations</i>	<i>Hours In-class/ Online</i>
Teaching group	Lectures		3,0
<b>Description of autonomous workload</b>			
<ul style="list-style-type: none"> <li>• Attending the lectures and problem solving sessions.</li> <li>• Active participation in classes.</li> <li>• Individual study and problem solving.</li> <li>• Use and consult the recommended bibliography, as well as making use of office hours.</li> <li>• Use of the resources available at Aula Virtual.</li> </ul>			

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<b>Content/Unit</b>			
Unit 2: Cooperative and non-cooperative games. Shapley's value.			
<b>Learning system and methodology</b>			
<i>System</i>	<i>Learning procedures and activities</i>	<i>Observations</i>	<i>Hours In-class/ Online</i>
Teaching group	Lectures		3,0
Work group	Problem solving		2,0
<b>Description of autonomous workload</b>			
<ul style="list-style-type: none"> <li>• Attending the lectures and problem solving sessions.</li> <li>• Active participation in classes.</li> <li>• Individual study and problem solving.</li> <li>• Use and consult the recommended bibliography, as well as making use of office hours.</li> <li>• Use of the resources available at Aula Virtual.</li> </ul>			
<b>Content/Unit</b>			
Unit 3: Matrix games and linear programming.			
<b>Learning system and methodology</b>			
<i>System</i>	<i>Learning procedures and activities</i>	<i>Observations</i>	<i>Hours In-class/ Online</i>
Teaching group	Lectures		2,0
	Tests and quizzes		1,0
Work group	Problem solving		2,0
<b>Description of autonomous workload</b>			
<ul style="list-style-type: none"> <li>• Attending the lectures and problem solving sessions.</li> <li>• Active participation in classes.</li> <li>• Individual study and problem solving.</li> <li>• Use and consult the recommended bibliography, as well as making use of office hours.</li> <li>• Use of the resources available at Aula Virtual.</li> </ul>			
<b>Module</b>	Module 4: Multicriterial optimization.		
<b>Content/Unit</b>			
Unit 1: Statement of the problem. Pareto-efficient solutions. Graphical solution of problems with two variables and two objective functions.			
<b>Learning system and methodology</b>			
<i>System</i>	<i>Learning procedures and activities</i>	<i>Observations</i>	<i>Hours In-class/ Online</i>
Teaching group	Lectures		2,0
Work group	Problem solving		1,0

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Description of autonomous workload			
<b>Content/Unit</b>			
Unit 2: Techniques of constructing Pareto-efficient solutions. Goal programming.			
<b>Learning system and methodology</b>			
<i>System</i>	<i>Learning procedures and activities</i>	<i>Observations</i>	<i>Hours In-class/ Online</i>
Teaching group	Lectures		3,0
	Tests and quizzes		1,0
Work group	Problem solving		2,0
<b>Description of autonomous workload</b>			

EVALUATION SYSTEM			
<b>Assessment criteria</b>			
<p>In order to pass it is necessary to score at least 5 points from a maximum of 10. The assessment takes into account two aspects:</p> <ol style="list-style-type: none"> <li>1. A written final exam, weighing 60% of the final grade.</li> <li>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.</li> </ol> <p>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.</p> <p>For the extraordinary final exam in September the result of the continuous evaluation carried out during the previous course will be taken into account, following the same criterion as for the ordinary final exam.</p>			
<b>Marking system</b>			
	<i>Activity</i>	<i>(Number of hours)</i>	<i>Percentage</i>
I. STUDENT 'S ACTIVITIES (In- class/Online)	• Teaching group	31	30 %
	• Work group/ small group [example]	14	30 %
II. STUDENT'S AUTONOMOUS ACTIVITIES (Autonomous work)	• Individual work [example]	105	40 %
<b>Assessment instruments</b>			
<ul style="list-style-type: none"> <li>• Test, quizzes, exercises, problem sets.</li> </ul>			

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- 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

- Aplicaciones de Álgebra Lineal (*Grossman, S.I.*) – Complementary bibliography
- Econometría (*Gujarati, D.N. y Porter, D.*) - Basic bibliography
- Econometría: modelos y pronósticos (*Pindyck, R.S., Rubinfeld, D.L.*) - Complementary bibliography
- Econometric Models, Techniques and Applications (*Intriligator, M.D, Bodkin, R.G. y Hsiao, C.*) - Complementary bibliography
- Fundamentos de optimización matemática para la economía y la empresa con Derive y Mathematica en un entorno Windows (*González, A., Calderón, S., Galache, T., Ordóñez, J.M. y Torrico, A.*) - Complementary bibliography
- Introducción a la investigación de operaciones (*Hillier, F.L. y Lieberman, G.L.*) - Basic bibliography
- Linear and nonlinear programming (*Luenberger, D.E.*) - Bibliografía básica Linear programming and economic analysis (*Dorfman, R., Samuelson, P.A., Solow, R.M.*) - Basic bibliography
- Linear programming and network flows (*Bazaraa, M.S. Jarvis, J.J., Sherali, H.D.*) - Complementary bibliography
- Matemáticas II. Economía y Empresa. Teoría. (*Rodríguez, J., Prieto, E., Hernández, V. y Gómez, P.*) - Complementary bibliography
- Modelos Económicos (*Pulido, A. y Pérez, J.*) - Complementary bibliography
- Programación lineal y no lineal (*Luenberger, D.E.*) - Basic bibliography
- Programación matemática (*Balbás de la Corte, Alejandro*) - Basic bibliography
- Teoría de juegos con aplicaciones a la economía (*Friedman, James W.*) - Basic 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*

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<http://home.ubalt.edu/ntsbarsh/Business-stat/opre/nonlinear.htm>  
*From Linear to Nonlinear Optimization with Business Applications*  
<http://www.ine.es>  
*Instituto Nacional de Estadística*  
<http://www.mineco.es>  
*Ministerio de Economía*  
<http://www.europa.eu.int>  
*EUROSTAT*  
<http://www.bde.es>  
*Banco de España*  
<http://www.funcas.es>  
*Fundación de las Cajas de Ahorro*

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