DEGREE CURRICULUM

QUANTITATIVE METHODS FOR LOGISTICS

Coordination: RIUS TORRENTÓ, JOSEP MARIA

Academic year 2021-22

QUANTITATIVE METHODS FOR LOGISTICS 2021-22

Subject's general information

<table>
<tr><td>Subject name</td><td>QUANTITATIVE METHODS FOR LOGISTICS</td></tr>
<tr><td>Code</td><td>102406</td></tr>
<tr><td>Semester</td><td>2nd Q(SEMESTER) CONTINUED EVALUATION</td></tr>
<tr><td>Typology</td><td>
<table>
<tr><th>Degree</th><th>Course</th><th>Character</th><th>Modality</th></tr>
<tr><td>Bachelor's degree in Industrial Organization and Logistics Engineering</td><td>3</td><td>COMPULSORY</td><td>Attendance-based</td></tr>
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<tr><td>Course number of credits (ECTS)</td><td>6</td></tr>
<tr><td>Type of activity, credits, and groups</td><td>
<table>
<tr><th>Activity type</th><th>PRAULA</th><th>TEORIA</th></tr>
<tr><td>Number of credits</td><td>3</td><td>3</td></tr>
<tr><td>Number of groups</td><td>1</td><td>1</td></tr>
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<tr><td>Coordination</td><td>RIUS TORRENTÓ, JOSEP MARIA</td></tr>
<tr><td>Department</td><td>BUSINESS ADMINISTRATION</td></tr>
<tr><td>Teaching load distribution between lectures and independent student work</td><td>60 classroom hours and 90 hours of independent work.</td></tr>
<tr><td>Important information on data processing</td><td>Consult this link for more information.</td></tr>
<tr><td>Language</td><td>Catalan and Spanish</td></tr>
<tr><td>Distribution of credits</td><td>3 theoretical credits and 3 practical credits.</td></tr>
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QUANTITATIVE METHODS FOR LOGISTICS 2021-22

Teaching staff	E-mail addresses	Credits taught by teacher	Office and hour of attention
PONS VILALTA, ADRIA	adria.pons@udl.cat	3,99	
RIUS TORRENTÓ, JOSEP MARIA	josep.riustorrento@udl.cat	2,01	

Subject's extra information

This course requires continuous work throughout the semester in order to achieve the objectives set. It requires critical thinking and capacity for abstraction.

It is recommended to visit the Virtual Campus space associated with the course frequently, since all the corresponding information is announced there and the material with which the subject will be developed will be published before the beginning of each topic.

Learning objectives

- Learn the approach to the management of a logistics transport network as a problem of mathematical optimization.
- Introduce the most important operational research models applied to problems and real cases of logistics networks.
- Study transport logistics networks and their nature, presenting examples and analyzing real cases.
- Study the logistic networks of fluid conduction, introducing the most important models and algorithms.
- Discuss the process followed in the approach and resolution of a problem and its results.
- Leanr how to use the mathematical language in the approach and resolution of linear programming problems.
- Discuss the approach and process of solving a problem, as well as the results interpretation.
- Choose accurately the approach and resolution method applied.
- Link and apply concepts studied in different subjects.

Competences

Basic competences

- **B02**. That students know how to apply their knowledge to their work or vocation in a professional manner and possess the skills that are usually demonstrated through the elaboration and defense of arguments and the resolution of problems within their area of study.
- **B03**. That students have the ability to gather and interpret relevant data (usually within their area of study) to make judgments that include a reflection on relevant social, scientific or ethical issues.
- **B04**. That students can transmit information, ideas, problems and solutions to a specialized and non-specialized public.
- **B05**. That students have developed those learning skills necessary to undertake further studies with a high degree of autonomy.

General competences

- **CG4**. To Solve problems with initiative, make decisions, creativity, critical reasoning and to communicate and transmit knowledge, skills and abilities in the field of Chemical Engineering/Industrial Organization Engineering.
- **CG6**. To implement specifications, regulations and mandatory rules.
- **CG9**. To organize and plan in the field of the company, and other institutions and organizations.
- **CG10**. To work in a multilingual and multidisciplinary environment.

Specific competencess

- **CE15**. To apply the basic knowledge of production and manufacturing systems.
- **CE19**. To have applied knowledge of basics and principles of quality management and technological innovation.
- **CE22**. To acquire capacity to design enterprise information systems.
- **CE29**. To acquire capacity to design and optimize the logistics and transportation.
- **CE30**. To acquire capacity to supply chain management.
- **CE31**. To acquire capacity for production planning and control, maintenance program implementation and perform statistical process control.

Transversal competences

- **CT1**. To develop a proper understanding and oral and written expression of Catalan and Spanish.

- **CT3**. To implement new technologies and technologies of information and communication.
- **CT5**. To apply essential notions of scientific thinking.

Subject contents

Lesson 1. Models of logistics networks

- The trasnportation problem
- The assignment problem
- The transshipment problem
- The traveler problem
- The minimum expansion tree problem
- The shortest path problem
- The maximum flow problem
- The inventory problem
- The localization problem

Lesson 2. Queueing theory

- Introduction to the queueing lines
- Queueing lines main features
- Application of queueing models in systems design
- Queueing lines modeling

Lesson 3. Markov chains

- Introduction. Stochastic processes
- Markov chain classification
- Markov chain long-term properties

Methodology

Each week the student will attend to four hours of virtual and classroom lectures. Two of them will be held in the classroom, where the theoretical contents of the subject will be presented, combined by practical examples and methods for problem solving. As support material for the lectures, we will use slides provided to the students through the virtual campus.

In the other two hours the concepts presented on the theory lectures will be applied to practical cases. Computer software will be used to solve the problems and practical examples.

In addition, in this subject, along with Industrial Economics and Innovation and Information and Distribution Systems, the student will carry out an Integrated Project (see degree curriculum) applying together contents of the three subjects. For this, every three weeks of class, a two-hour session will be devoted to the realization of said project, solving doubts and guiding the student during its elaboration. In addition, there will be a coordinator in charge of monitoring the tasks defined on a script provided at the beginning of the semester.

Development plan

Week	Activities	Personal Study
1	*Introduction*	
2-4	*Lectures*	4 h/week. Personal study and problems resolution
4	*Integrated Project*	8 hours. Integrated project eleboration
5-8	*Practical cases*	4 h/week. Personal study and problems resolution
8	*Integrated Project*	8 hours. Integrated project eleboration
9	*Test*	8 hours. Test preparation
10-12	*Lectures*	4 h/week. Personal study and problems resolution
12	*Integrated Project*	8 hours. Integrated project eleboration
13-14	*Practical cases*	4 h/week. Personal study and problems resolution
15	*Integrated Project*	8 hours. Integrated project eleboration
16-17	*Final Exam*	8 hours. Examen preparation
18	*Tutorship*	

19	*Recovery*	

Evaluation

Acr.	Evaluation Activities	Weigh	Minimum rate	Groupal	Mandatori	Recoverable
PRA1	*Practical cases 1*	20%	NO	NO	YES	NO
PRA23	*Practical cases 2-3*	20%	NO	NO	YES	NO
E1	*Final Exam*	45%	3	NO	YES	YES
INTP	*Integrated Project*	15%	NO	NO	YES	NO
FinalScore = 0,20*PRA1 + 0,20*PRA23 + 0,45*E1 + 0,15*INTP						

Bibliography

Paul W. Williams. *Model Building in Mathematical Programming.* Ed. JOHN WILEY AND SONS.

Hillier F. S., Lieberman G.J. (2010) Introducción a la Investigación de Operaciones, 9ª ed. McGraw-Hill

Ríos Insua, S. (1996) *Investigación operativa. Programación lineal i aplicaciones*. Ed. CERA.

Winston, W.L. (2005) *Investigación de operaciones. Aplicaciones y algoritmos*. Ed.Thomson.

Hillier F.S., Hillier M.S. (2008) *Métodos cuantitativos para administración*, 3ª ed. McGraw-Hill.

Serra D. (2003) *Métodos cuantitativos para la toma de decisiones*. Gestión 2000.