COURSE DATA

Data Subject	
Code	36444
Name	Data-based logistics
Cycle	Grade
ECTS Credits	4.5
Academic year	2021 - 2022

Study (s)

Degree	Center	Acad. year	Period
1406 - Degree in Data Science	School of Engineering	4	Second term

Subject-matter

Degree	Subject-matter	Character
1406 - Degree in Data Science	21 - Data-driven Logistics	Optional

Coordination

Name	Department
BELENGUER RIBERA, JOSE MANUEL	130 - Statistics and Operational Research

SUMMARY

Data-based Logistics is a compulsory subject in the second semester of the fourth year of the Degree in Data Science with a course load of 4.5 ECTS credits.
Logistics includes the organisation, movement and storage of materials. Today's economy, with an ever-increasing volume of data and increasingly competitive markets, demands more efficient logistics management. Companies have to solve the problem of having the right people and the right materials at the right time and in the right place. Logistics activities include inventory management, location problems and distribution and transport problems. Inventory management is a critical aspect of resource management to meet the objectives of good customer service and efficient production, keeping inventories at a minimum level, which suggests developing appropriate models to forecast the availability of materials in the face of unforeseen circumstances. The transport and distribution of goods, both own and third party, as well as the location of resources, has to cover the great variability of real situations in which these problems arise. The related models and the most efficient tools to solve all these problems will be studied. The aim is to provide students with a set of methods and models that will enable them to face the different situations that may arise in a public and/or business organization.
The theory classes will be imparted in Spanish and the practical and laboratory classes will be imparted in English. as stated in the course description available on the website of the degree course.

PREVIOUS KNOWLEDGE

Relationship to other subjects of the same degree

There are no specified enrollment restrictions with other subjects of the curriculum.

Other requirements

Without any prerequisites for enrolment, it is recommended to review the knowledge and contents of the first-year subjects: Optimisation, Data Structures and Algorithms and Programming fundamentals.Without any prerequisites for enrolment, it is recommended to review the knowledge and contents of the first-year subjects: Optimisation, Data Structures and Algorithms and Programming fundamentals.

OUTCOMES

1406 - Degree in Data Science

- (CG03) Capability to elaborate models, calculations, reports, to plan tasks and other works analogous to the specific field of data science.
- (CG05) Analysis and synthesis capability in the preparation of reports and in the defence of ideas.
- (CG06) Ability to access and manage information in different formats for subsequent analysis in order to obtain knowledge from data.
- (CT05) Ability to evaluate the advantages and disadvantages of different methodological and / or technological alternatives in different fields of application.
- (CE05) To understand the most relevant fields of application of data science and understand how data science is used to base and perform decision-making based on data
- (CE13) To know how to design, apply and evaluate data science algorithms for the resolution of complex problems.
- (CB2) Students must be able to apply their knowledge to their work or vocation in a professional manner and have acquired the competences required for the preparation and defence of arguments and for problem solving in their field of study.
- (CB4) Students must be able to communicate information, ideas, problems and solutions to both expert and lay audiences.
- (CB5) Students must have developed the learning skills needed to undertake further study with a high degree of autonomy.

LEARNING OUTCOMES

To know how to construct localisation models appropriate to the problem to be solved. (CB2, CG03, CT05, CE05, CE13).
To know how to model and solve vertex and arc routing problems. (CB2, CG03, CT05, CE05, CE13).
To know how to build models for the management of warehouses. (CB2, CG03, CT05, CE05, CE13).
To know the basic techniques of multi-criteria optimisation and know how to apply them to logistics problems. (CB2, CG03, CT05, CE05, CE13).
To know the existing tools for the exact solution of the models. (CB2, CB5, CG03, CG06, CT05, CE05, CE13).
To design and implement heuristic and metaheuristic algorithms appropriate to each problem. (CB2, CB4, CG03, CG06, CT05, CE05, CE13).

DESCRIPTION OF CONTENTS

1. Logistics and supply chain

1.1. Definition of Logistics.
1.2. Supply chain.
1.3. Types of Logistics.
1.4. Management of the logistics system.

2. Linear and Integer Programming

2.1. Linear Programming Models. Simplex Method.
2.2. Integer Programming Models.
2.3. Branch and bound algorithms.
2.4. Cutting plane algorithms.

3. Heuristic and metaheuristic algorithms

3.1. Constructive heuristics.
3.2. Local search.
3.3. Metaheuristics.

4. Multi-Objective problems

4.1. Goal programming.
4.2. Multi-Objective model.

5. Location problems

5.1. Continuous location problems.
5.2. Discrete location problems.
5.3. p-centre problems.

6. Distribution problems

6.1. Vehicle routing problems.
6.2. Arc routing problems.

7. Warehouse management problems

7.1. Warehouse design.
7.2. Inventory management.

WORKLOAD

ACTIVITY	Hours	% To be attended
Theory classes	24,00	100
Laboratory practices	15,00	100
Classroom practices	6,00	100
Development of group work	10,00	0
Development of individual work	18,00	0
Study and independent work	10,00	0
Preparation of evaluation activities	10,00	0
Preparing lectures	7,50	0
Preparation of practical classes and problem	7,00	0
Resolution of case studies	5,00	0
TOTAL	**112,50**	

TEACHING METHODOLOGY

MD1 - Theoretical activities. Expository development of the subject (CG01) with student participation in the resolution of specific questions (CB2, CB4, CT03).
In the face-to-face theoretical activities, the topics of the subject will be developed, encouraging, at all times, the participation of students (CT03).
MD2 - Practical activities. Learning through problem solving, exercises and case studies through which competences on the different aspects of the subject are acquired (CB2, CG03, CE13).
Theoretical explanations are complemented with practical activities with the aim of applying the basic concepts and acquiring a working knowledge of logistics problem-solving methods.
MD4 - Computer classroom work. Learning through activities developed in small groups and carried out

in computer classrooms (CB2, CB4, CB5, CG03, CT05, CE05, CE13).
In addition to face-to-face activities, students will have to carry out work outside the classroom, related to class practices, as well as class and exam preparation (CG03). Some of these tasks will be carried out individually, to promote autonomous work, but there will also be work that will require the participation of small groups of students (2-3) to promote the ability to integrate into working groups (CG03, CT05).
The Virtual Classroom of the Universitat de València will be used as a support for communication with students. Through it, students will have access to the didactic material used in class, as well as the problems and exercises to be solved.

EVALUATION

The course will be evaluated according to 3 types of aspects:
SE1 - Objective test, consisting of one or several exams that include both theoretical-practical questions and problems.
SE2 - Evaluation of practical activities based on the elaboration of works and/or oral presentations.
SE3 - Continuous assessment of each student, based on the participation and degree of involvement of the student in the teaching-learning process, taking into account regular attendance at the scheduled face-to-face activities and the resolution of questions and problems proposed periodically.
The following considerations will be taken into account in each of these aspects:
SE1: An exam will be held at the end of the course which will consist of both theoretical-practical questions and problems (CB2, CB4, CB5, CG03, CG05, CT05, CE05, CE13).
SE2: Evaluation of the work related to the laboratory practical considering two aspects
SE2-1 (50%): Implementation of algorithms and elaboration of a report with their description and the results obtained. (CB2, CB4, CB5, CG03, CG05, CG06, CE05, CE13).
SE2-2 (50%): Resolution of questions and problems proposed in class (CB2, CG03, CT05).
SE3: Continuous assessment of each student considering two aspects:
SE3-1 (50%): Regular attendance to the scheduled classroom activities (CB2, CG03).
SE3-2 (50%): Resolution of questions and problems proposed in class (CB2, CG03, CT05).
The final grade of the course will be calculated as the weighted average of the 3 previous sections, according to the following criteria: SE1 (20%), SE2 (70%), SE3 (10%).
Particular considerations on the evaluation:
- Non-recoverable sections: The criteria that evaluate the monitoring of the subject during the teaching period are not recoverable afterwards. These are: SE3-1 and SE3-2. Criterion SE2-1 will not be recoverable either, as it requires much more time than an exam-type assessment test. Criterion SE2-2 will be recoverable, only at the 2nd call, by means of an individual practical exam carried out in conditions equivalent to those of a practical, but with a limitation of time and access to support materials.
- Sections requiring a minimum mark: A minimum mark of 4 (out of 10) must be obtained in each of the following evaluation sections in order to pass the course: SE1, SE2-1 and SE2-2.
In any case, the evaluation system will be governed by the one established by the Evaluation and Grading Regulations of the University of Valencia for Degrees and Masters:
(https://webges.uv.es/uvtaeweb/muestrainformacionedictopublicofrontaction.do?accion=inicio&idedictoseleccionado=5639).

REFERENCES

Basic

- G. P. Ghiani, G. Laporte y R. Musmanno (2013). Introduction to Logistic Systems Planning and Control. Wiley, 2ª edición.
- C. Bozart y R. B. Handfield (2012). Introduction to Operations and Supply Chain Management. Prentice Hall, 3ª edición.
- S. Chopra y P. Meindl (2012). Supply Chain Management. Strategy, Planning, and Operation. Prentice Hall, 5ª edición.
- G. Laporte, S. Nickel y F. Saldanha da Gama (2019). Location Science. Wiley.
- A. Corberán y G. Laporte (2014). Arc Routing: Problems, Methods, and Applications. SIAM.
- D. Vigo y P. Toth (2014). Vehicle Routing: Problems, Methods, and Applications. SIAM, 2ª edición.

Additional

- C. Dhaenens y L. Jourdan (2016). Metaheuristics for Big Data. Wiley.
- W.L. Winston y W. Albright (2011). Practical Management Science. Duxbury Press, 4ª edición.
- Hillier, F.S. y Lieberman, G.J.: Introducción a la Investigación de Operaciones. McGraw-Hill (2010), 9ª edición.
- H. Williams (2013). Model Building in Mathematical Programming. Wiley, 5ª edición.
- H. Taha (2012). Investigación de Operaciones. Pearson Educación, 9ª edición.
- M. H. Hugos (2011). Essentials of Supply Chain Management. Wiley, 3ª edición.

ADDENDUM COVID-19

This addendum will only be activated if the health situation requires so and with the prior agreement of the Governing Council

The teaching methodology of the subject will follow the Teaching Model approved by the Academic Commission of the Degree in Data Science (https://go.uv.es/cienciadatos/ModelDocentGCD).

If the facilities are closed for health reasons and that closure affects totally or partially the classes of the subject, these will be replaced by non-face-to-face sessions following the established schedules. If the closure affects any face-to-face assessment test of the subject, this will be replaced by a test of a similar nature that will be carried out in virtual mode through the computer tools supported by the University of Valencia. The percentages of each evaluation test will remain unchanged, as established by this guide.