

**COURSE DATA****Data Subject**

Code	36406
Name	Discrete mathematics
Cycle	Grade
ECTS Credits	6.0
Academic year	2022 - 2023

Study (s)

Degree	Center	Acad. year	Period
1406 - Degree in Data Science	School of Engineering	1	First term

Subject-matter

Degree	Subject-matter	Character
1406 - Degree in Data Science	1 - Mathematics	Basic Training

Coordination

Name	Department
PEREZ CALABUIG, VICENT	363 - Mathematics

SUMMARY

In the subject Discrete Mathematics, a series of mathematical concepts which are fundamental in disciplines like mathematics, computer science, and data science will be studied. In this subject the foundations of logic, set theory, relations, combinatorial analysis and graph theory needed for the future graduates in data science will be developed.

Theory lessons will be taught in Spanish and practical and laboratory lessons as according to the information sheet available on the web page of the degree.

PREVIOUS KNOWLEDGE



Relationship to other subjects of the same degree

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

Other requirements

Given the basic character of the subject and its placement in the curriculum, there are no more requisites than the ones to access these studies.

OUTCOMES

1406 - Degree in Data Science

- (CG01) Knowledge of basic subjects and technologies that enable students to learn new methods and technologies, and to provide them with versatility to adapt to new situations.
- (CG05) Analysis and synthesis capability in the preparation of reports and in the defence of ideas.
- (CT03) Ability to defend your own work with rigor and arguments and to expose it in an adequate and accurate way with the use of the necessary means.
- (CE01) Ability to solve the mathematical problems that can be posed in data science and be able to apply knowledge on: linear algebra, differential and integral calculus and numerical methods and optimisation.
- (CB1) Students must have acquired knowledge and understanding in a specific field of study, on the basis of general secondary education and at a level that includes mainly knowledge drawn from advanced textbooks, but also some cutting-edge knowledge in their field of study.
- (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.

LEARNING OUTCOMES

- To understand the foundations of mathematical reasoning, mathematical proofs and algorithmic reasoning (CB1, CB2, CG01, CG05, CT03, CE01).
- To know how to formalise information by means of logical sentences (CB1, CB2, CG01, CG05, CT03, CE01).
- To understand the foundations of number theory and to be able to apply them in problem solving (CB1, CG01, CT03, CE01).
- To understand and to know the basic properties of trees and graphs and to be able to relate these structures with practical examples (CB1, CB2, CG01, CT03, CE01)



DESCRIPTION OF CONTENTS

1. Logic

Basic concepts
Propositional logic, proof methods
Predicate logic
Inference in predicate logic
Recurrence and induction

2. Sets and relations

Sets, correspondences, maps, and sequences
Binary relations

3. Graphs and trees

Graphs
Paths and cycles
Graph colouring
Connectedness
Representation of graphs in programs
Trees: types of trees and forests

4. Lattices and Boole algebras

Boolean lattices and algebras
Boolean functions

5. Arithmetic

Binary operations
Divisibility and modular arithmetic

6. Combinatorial analysis

Counting and combinatorial analysis

**WORKLOAD**

ACTIVITY	Hours	% To be attended
Theory classes	28,00	100
Laboratory practices	20,00	100
Classroom practices	12,00	100
Development of group work	5,00	0
Development of individual work	10,00	0
Study and independent work	20,00	0
Readings supplementary material	5,00	0
Preparation of evaluation activities	25,00	0
Preparing lectures	5,00	0
Preparation of practical classes and problem	20,00	0
TOTAL	150,00	

TEACHING METHODOLOGY

Theoretical lessons: In theory lessons, the concepts will be explained and illustrated with examples, by using in some occasions some computer tools for calculation or graphical representation. The standard procedures for solving problems related with the subject will be explained. (MD1, developed competences: CB1, CB2, CG01)

Problem lessons: Most exercises will be solved during problem lessons by the students themselves or by the teacher. This work might be acknowledged in the final score. (MD2, developed competences: CB1, CB2, CG01, CG05, CT03, CE01)

Laboratory lessons: The aim of these lessons will be to use computer tools to state and solve problems related with the subject. The R computer system and some of its libraries will be mainly used. The work done in these lectures will be taken into account in the final assessment. (MD4, developed competences: CB1, CB2, CG01, CG05, CT03, CE01).

The contents of Lectures 1, 2, 3, and 4 will be developed in the theory lessons, problem lessons and laboratory lessons, while the contents of Lectures 5 and 6 will be developed only in the laboratory lessons.

EVALUATION

The assessment will be carried out using the following method:



- There will be a final exam, fundamentally practical, and with a weight of 50 % in the final score. In order to pass the subject, it will be necessary to obtain a minimum mark of 4 points (over 10) in this exam. Students that do not achieve this minimum mark in the final exam will be rated “fail” and their final score will not exceed 4 points. Students that do not pass the subject in the first call will have the day of the second call a new final exam under the same conditions. (SE1, assessed competences: CB1, CB2, CG01, CG05, CT03, CE01)
- 35 % of the score will correspond to the lessons in computer laboratory, where students will have to solve and present in front of their colleagues or to deliver for correction the works that the teacher has proposed for this effect. The active participation of students in these lectures will be rated, which could be used to improve the rating in this part. Students that do not pass the subject in the first call will have the possibility of using the score obtained in the first call in this part, but only in the case it is greater than or equal to 5 points, or to do a final recovery test in a computer laboratory under conditions similar to the classes of computer laboratory the same day of the second call. For organisation reasons, the teachers might require a previous inscription to this recovery test that will be announced in advance. (SE2/SE3, assessed competences: CB1, CB2, CG01, CG05, CT03, CE01)
- 15 % of the score will be obtained by continuous assessment of the student carried out during problem lessons. Students will have to solve and present in front of their colleagues or deliver for correction the works that the teacher has proposed for this effect. The active participation of students in these lectures will be rated, which could be used to improve the rating in this part. This part of the score will not be recoverable in the second call. Students that do not pass the subject in the first call will use in the second call the score obtained in this part in the first call. (SE2/SE3, assessed competences: CB1, CB2, CG01, CG05, CT03, CE01)

In any case, the assessment system will follow what is established in the Regulations for assessment and qualification of the Universitat de València for degrees and masters

<https://webges.uv.es/uvTaeWeb/MuestraInformacionEdictoPublicoFrontAction.do?accion=inicio&idEdictoSeleccionado=5639>

REFERENCES

Basic

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- Carmen Alegre, Ana Martínez, M. Carmen Pedraza: Problemas de matemática discreta. Ed. Universitat Politècnica de València, València, 1997
- Félix García Merayo: Matemática discreta. Paraninfo, Madrid, 2015

Additional

- Antonio Vera López, Ramón Esteban Romero: Problemas y ejercicios de matemática discreta. AVL, Bilbao, 1995



- Ralph P. Grimaldi: Matemática discreta y combinatoria: una introducción con aplicaciones. Addison-Wesley Longman, México, 1998
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