COURSE DATA

DATA SUBJECT

Code: 36406
Name: Discrete mathematics
Cycle: Undergraduate Studies
ECTS Credits: 6
Academic year: 2025-26

STUDY (S)

Degree	Center	Acad. year	Period
1406 - Degree in Data Science	Escola Tècnica Superior d'Enginyeria	1	First quarter

SUBJECT-MATTER

Degree	Subject-matter	Character
1406 - Degree in Data Science	Mathematics	BASIC

COORDINATION

PEREZ CALABUIG VICENT

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.

COMPETENCES / LEARNING OUTCOMES

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(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.

(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.

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.

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.

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

PRESENCIAL ACTIVITIES

Activity	Hours
Theory	28,00
Laboratory	20,00
Classroom practices	12,00
Total hours	**60,00**

NON PRESENCIAL ACTIVITIES

Activity	Hours
Attendance at other activities	0,00
Individual or group project	15,00
Independent study and work	25,00
Preparation of lessons	25,00
Preparation for assessment activities	25,00
Resolution of case studies	0,00
Total hours	**90,00**

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).

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 computer laboratory classes, where the student will solve and present to their colleagues or submit for correction the works that the teacher has proposed for this effect. The active participation of students in these classes will also be rated, which could be used to improve the rating in this part. Whenever the laboratory score is greater than or equal to 5, it is possible to use the same score in the second call for those students that do not pass the subject in the first call. Otherwise, in the same day of the second call there will be a final laboratory exam. For the sake of the organisation, teachers may require prior registration for this recovery test, which would be announced well 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 (ACGUV 123/2020).

Copying or plagiarism of any activity that is part of the evaluation will result in the impossibility of passing the course, and the student will then be subject to the appropriate disciplinary procedures indicated in the ACTION PROTOCOL FOR FRAUDULENT PRACTICES AT THE UNIVERSITY OF VALENCIA (ACGUV 123/2020).

REFERENCES

- 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
- Kenneth H. Rosen: Matemática discreta y sus aplicaciones. McGraw Hill, Madrid, 2013. http: //www.dawsonera.com/depp/reader/protected/external/AbstractView/S9788448191269
- Robert Fuster: Matemàtica discreta. Ed. Universitat Politècnica de València, València, 2016
- 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
- David J. Hunter: Essentials of discrete mathematics. Jones & Bartlett Learning, Burlington, MA, USA, 2017. http://proquest.safaribooksonline.com/?uiCode=valencia&xmlId=9781284056242
- Jean Gallier: Discrete Mathematics. Springer, New York-Dordrecth-Heidelberg-London, 2011. https://link.springer.com/book/10.1007%2F978-1-4419-8047-2
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