COURSE DATA

DATA SUBJECT

Code: 34149
Name: Discrete mathematics
Cycle: Undergraduate Studies
ECTS Credits: 6
Academic year: 2025-26

STUDY (S)

Degree	Center	Acad. year	Period
1107 - Degree in Mathematics	Facultat de Ciències Matemàtiques	1	Second quarter

SUBJECT-MATTER

Degree	Subject-matter	Character
1107 - Degree in Mathematics	Mathematics	BASIC

COORDINATION

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SUMMARY

Discrete mathematics, as opposed to mathematical analysis, studies structures with finite or countable sets. It uses recursion and induction as the main ingredients in the proofs of their results. The concern is over the algorithm that allows finding the solution of a problem than the solution explicitly.

Two of the specific skills of the Degree in Mathematics are the ability to reason logically and to identify errors in the deductive processes and the capacity for abstraction and modeling.

It is in the discrete mathematics course where one can exercise that strengthens learning ability problems using mathematical reasoning simple statement, for in them the inherent mathematical structure, and draw consequences from the presence of this structure.

Combinatorial techniques for counting finite sets, recurrence relations and finite difference equations, an introduction to graph and tree theory and simple algorithms for modular arithmetic will be studied.

PREVIOUS KNOWLEDGE

RELATIONSHIP TO OTHER SUBJECTS OF THE SAME DEGREE

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

OTHER REQUIREMENTS

COMPETENCES / LEARNING OUTCOMES

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Ability to work in teams.

Capacity for analysis and synthesis.

Capacity of abstraction and modeling.

Expressing mathematically in a rigorous and clear manner.

Knowing the time and the historical context in which occurred the great contributions of women and men in the development of mathematics.

Learn autonomously.

Possess and understand the mathematical knowledge.

Reason logically and identify errors in the procedures.

DESCRIPTION OF CONTENTS

1. Enumeration and combinatorial methods

- Permutations, combinations and factorials.
- Principle of inclusion-exclusion.
- Generalized permutations and combinations.
- Generating functions.

2. Recurrences and finite difference equations

- Recurrence relations.
- Solving linear recurrence relations.
- Finite difference equations.
- Solving simple finite difference equations.

3. Elementary Graph Theory

- Notion of graph. Isomorphism.
- Subgraph, components and adjacency matrix.
- Hamiltonian paths and cycles or eulerians. Connectivity.
- Introduction to tree-like structures.
- Algorithm for calculating a minimum cost tree generator in a complete graph with weights.
- Bipartite graphs. Perfect matchings.

4. Modular arithmetic

- Modular arithmetic in the integers.
- Fermat's little theorem.
- Chinese remainder theorem.
- Linear Diophantine equations.
- Applications of number theory. Public key cryptographic systems.

WORKLOAD

PRESENCIAL ACTIVITIES

Activity	Hours
Theory	30,00
Other activities	7,50
Classroom practices	22,50
Total hours	**60,00**

NON PRESENCIAL ACTIVITIES

Activity	Hours
Attendance at other activities	0,00
Individual or group project	10,00
Independent study and work	27,50
Preparation of lessons	15,00
Preparation for assessment activities	37,50
Resolution of case studies	0,00
Total hours	**90,00**

TEACHING METHODOLOGY

In the theoretical classes will be introduced and developed the content of each issue. In practical classes will be applied the concepts expressed in lectures and wherever possible will use tools. We propose to students performing works of two types. First, for each of the four themes of the course will mount questionnaires in the virtual classroom. Each student must complete a questionnaire with questions randomly selected from a battery of questions with multiple answers. The questionnaires will be active over a week or so, but will have a time limit to complete them once initiated, and a small number of attempts.

Second, for each of the five seminar sessions will prepare a list of issues that will be posted in advance in the virtual classroom. Students at most in groups of two, will solve some of them and deliver them to the teacher at the end of the class. The teacher will resolve any questions that may arise during the session.

EVALUATION

Students must demonstrate their knowledge of the subject acquired throughout the course through written tests, online classroom assessment questionnaires, and assignments. Students will be evaluated through an essentially practical exam, as well as through the results obtained on the assessment questionnaires posted in the online classroom and through the presentation of solved problem sets that will be proposed throughout the semester.

In accordance with UV regulations, if faculty members detect evidence of fraudulent implementation of continuous assessment activities that imply a lack of the required knowledge on the part of students, the assessment activity may be graded negatively or with a zero.

The weighting in the final grade for the course among the final exam, the grade of the questionnaires and the proposed work is 80%, 10% and 10% respectively. The minimum grade on the final exam required to make the average with the other two notes is 4 points out of 10.

REFERENCES

- Kenneth H. Rosen, "Discrete Mathematics and its applications", sisena edició, Mac-Graw-Hill Int., Singapur, 2006. Edición en Español: Matemática Discreta y sus aplicaciones. Mc Graw Hill 2004. Students Solution Guide for Discrete Mathematics and its applications. K.H. Rosen. Mc Graw Hill, 1999.
- J. Matousek, J. Nesetril "An Invitation to Discrete Mathematics", segona edició, Oxford University Press, Oxford, 2008.

Complementary references:

- S. Lipschutz, M. L. Lipson. Discrete Mathematics (2nd Ed.). McGraw-Hill, 1997
- C. García, J. Ma López, Dolors Puigjaner.Matemática Discreta. Pearson Educación (Prentice Hall), 2002.
- Comellas, Francesc, "Matemática discreta", Edicions de la UPC, Barcelona, 2001.
- Meavilla Seguí, Vicente, "201 problemas resueltos de matemática discreta", Zaragoza Universidad de Zaragoza, Prensas Universitarias 2000