SUBJECT TEACHING GUIDE

G2079 - Discrete Mathematics

Double Degree in Physics and Mathematics
Degree in Mathematics

Academic year 2026 - 2027

1. IDENTIFYING DATA					
Degree	Double Degree in Physics and Mathematics Degree in Mathematics			Type and Year	Core. Year 2 Core. Year 1
Faculty	Faculty of Sciences				
Discipline					
Course unit title and code	G2079 - Discrete Mathematics				
Number of ECTS credits allocated	6	Term		Semester based (2)	
Knowledge Field	Mathematics and statistics				
Web					
Language of instruction	Spanish	English Friendly	Yes	Mode of delivery	Face-to-face

Department	DPTO. MATEMATICAS, ESTADISTICA Y COMPUTACION
Name of lecturer	MONICA BLANCO GOMEZ
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Other lecturers	

4. OBJECTIVES

Discrete mathematics is an increasingly important branch of mathematics, both pure and applied. This course uses an introductory sample of discrete mathematics (combinatorics, finite groups and graph theory) to challenge the students with new mathematical structures, to make them work with objects that allow for small concrete cases, while at the same time generalizing to the abstract concept for arbitrarily large cardinals.
The rich variety of the topics allows to provide the students with a repository of mathematical tools and strategies to learn different ways of organizing proofs, information, and applying algorithms, etc.

6. SUBJECT PROGRAM

CONTENTS

1	COMBINATORICS Introduction to combinatorics. Counting techniques. Inclusion-exclusion principle. Factorial and binomial numbers. Binomial theorem. Variations, permutations, combinations. Decompositions and partitions of a number, partitions of a set. Diofantic equations. Recurrencies. Fibonacci and Catalan numbers. Introduction to GROUP THEORY. Basic notions. Law of internal composition. Subgroups. Examples of finite groups. Order of an element and cyclic groups. Symmetric group, dihedral group, alternating group. Action of a group on a set.
2	GRAPH THEORY Introduction to graphs. Representation of graphs. Isomorphism. Automorphism group. Connectivity, paths and cycles. Eulerian and Hamiltonian graphs. Trees, spanning trees. Depth first search and breadth first search. Colorings of graphs. Chromatic number and polynomial. Weighted graphs. Minimum weight paths and spanning trees. Kruskal's, Prim's and Dijkstra• s algorithm. Bipartite graphs. Matchings. Hall's Theorem and augmenting paths. Planar graphs. Kuratowski's Theorem. Euler's formula. Four color theorem. Polyhedra and f-vectors.
3	Preparation and realization of final exam.

7. ASSESSMENT METHODS AND CRITERIA

Description	Type	Final Eval.	Reassessment	%
Final exam (60%)	Written exam	Yes	Yes	60,00
2 hour tests that can amount to 40% of the final grade	Written exam	No	Yes	40,00
TOTAL				100,00

Observations

A minimum grade of 3/10 is required for each block of contents (Combinatorics (+Groups) & Graph Theory), where this grade is the maximum between 60% of the final exam and 40% of the continuous evaluation, or 100% of the final exam.
The final grade will have to be a minimum of 5: 50% combinatorics, 50% graph theory.

Observations for part-time students

Same as full-time students.

8. BIBLIOGRAPHY AND TEACHING MATERIALS

BASIC

R. P. Grimaldi: Matemáticas discreta y combinatoria : una introducción con aplicaciones. Addison-Wesley, 1998.

N. Biggs. Matemática discreta. Vicen Vives, 1994.