

Course guide

270203 - LMD - Logic and Discrete Mathematics

Last modified: 19/07/2023

Unit in charge: Barcelona School of Informatics
Teaching unit: 749 - MAT - Department of Mathematics.

Degree: BACHELOR'S DEGREE IN DATA SCIENCE AND ENGINEERING (Syllabus 2017). (Compulsory subject).

Academic year: 2023 **ECTS Credits:** 7.5 **Languages:** Catalan

LECTURER

Coordinating lecturer: MARCOS NOY SERRANO

Others: Primer quadrimestre:
MARCOS NOY SERRANO - 11, 12
GUILLEM PERARNAU LLOBET - 11, 12

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:

CE1. Skillfully use mathematical concepts and methods that underlie the problems of science and data engineering.

Generical:

CG5. To be able to draw on fundamental knowledge and sound work methodologies acquired during the studies to adapt to the new technological scenarios of the future.

Transversal:

CT5. Solvent use of information resources. Manage the acquisition, structuring, analysis and visualization of data and information in the field of specialty and critically evaluate the results of such management.

CT6. Autonomous Learning. Detect deficiencies in one's own knowledge and overcome them through critical reflection and the choice of the best action to extend this knowledge.

Basic:

CB1. That students have demonstrated to possess and understand knowledge in an area of study that starts from the base of general secondary education, and is usually found at a level that, although supported by advanced textbooks, also includes some aspects that imply Knowledge from the vanguard of their field of study.

TEACHING METHODOLOGY

In the theory classes the subject is exposed, complementing it with examples and applications. in the problem sessions we'll discuss problems from a list, encouraging the active participation of students.

LEARNING OBJECTIVES OF THE SUBJECT

- 1.To know the language of mathematical logic
- 2.To understand basic arithmetic of integers and polynomials, specially the computational aspects
- 4.To know the basic results of enumerative combinatorics
- 5.To know the basics of graph theory, with emphasis on algorithmic problems



STUDY LOAD

Type	Hours	Percentage
Hours large group	45,0	24.00
Self study	112,5	60.00
Hours small group	30,0	16.00

Total learning time: 187.5 h

CONTENTS

Sets and proofs

Description:

The language of set theory. Demonstrations in mathematics. The induction method.

Propositional and predicate calculus

Description:

Boolean formulas. Assignment and truth tables. Satisfiability. First-order logic.

Arithmetics of integers, polynomials, and complex numbers

Description:

Divisibility of integers. Maximum common divisor. Congruences Divisibility and congruence of polynomials. Roots and factorization. Complex numbers (binomial, polar and Moivre exponential form).

Basic enumeration and recurrences

Description:

Permutations, sets, and multisets. Binomial numbers. The principle of inclusion and exclusion. Recurrence equations. Resolution of linear recurrence equations.

Graphs and trees

Description:

Basic concepts of graph theory. Distances and connectivity. Representation and exploration of graphs. Eulerian graphs. Minimal spanning tree: Kruskal and Prim algorithms.

Planarity and colouring

Description:

Planar graphs. Euler's formula. Graph colouring, algorithms.



ACTIVITIES

Problem solving

Specific objectives:

1, 2, 4, 5

Related competencies :

CG5. To be able to draw on fundamental knowledge and sound work methodologies acquired during the studies to adapt to the new technological scenarios of the future.

CE1. Skillfully use mathematical concepts and methods that underlie the problems of science and data engineering.

CT6. Autonomous Learning. Detect deficiencies in one's own knowledge and overcome them through critical reflection and the choice of the best action to extend this knowledge.

CT5. Solvent use of information resources. Manage the acquisition, structuring, analysis and visualization of data and information in the field of specialty and critically evaluate the results of such management.

CB1. That students have demonstrated to possess and understand knowledge in an area of study that starts from the base of general secondary education, and is usually found at a level that, although supported by advanced textbooks, also includes some aspects that imply Knowledge from the vanguard of their field of study.

GRADING SYSTEM

Midterm exam (40%) and final exam (60%). On the day of the final exam students have the opportunity to resit the midterm. There will be a retake exam that will substitute 100% of the original grade.

BIBLIOGRAPHY

Basic:

- Comellas Padró, F ... [et al.]. Matemàtica discreta. Edicions UPC, 2001. ISBN 8483014564.
- Matousek, Jiri; Nešetřil, Jaroslav. Invitación a la matemática discreta. Reverté, 2008. ISBN 9788429151800.
- Antoine, R.; Camps, R.; Moncasi, J. Introducció a l'àlgebra abstracta: amb elements de matemàtica discreta. Bellaterra: Universitat Autònoma de Barcelona, Servei de Publicacions, 2007. ISBN 9788449025150.
- Farré, R. Lógica para informáticos. Barcelona: Marcombo, 2011. ISBN 9788426716941.
- Biggs, Norman L. Discrete mathematics. 2nd. ed. Oxford University Press, 2002. ISBN 9780198507178.