

## DISCRETE MATHEMATICS

### 34006 - DISCRETE MATHEMATICS (2024-25)

#### General

**Code:** 34006

**Lecturer responsible:**

PENADES MARTINEZ, JOSE LEANDRO

**Credits ECTS:**

**6,00**

Theoretical credits:

1,20

Practical credits:

1,20

Distance-base hours:

3,60

#### Departments involved

- **Dept:** SCIENCE OF COMPUTING AND ARTIFICIAL INTELLIGENCE

**Area:** SCIENCE OF COMPUTING AND ARTIFICIAL INTELLIGENCE

**Theoretical credits:** 1,2

**Practical credits:** 1,2

This Dept. is responsible for the course.

This Dept. is responsible for the final mark record.

#### Study programmes where this course is taught

- [DEGREE IN COMPUTER ENGINEERING](#)  
Course type: CORE (Year: 1)
- [DOUBLE DEGREE IN COMPUTER ENGINEERING AND BUSINESS ADMINISTRATION](#)  
Course type: CORE (Year: 2)

#### Competencies and objectives

##### Course context for academic year 2024-25

Discrete Mathematics is a basic course that provides students with the basic knowledge, both theoretical and empirical, necessary to understand, analyse and solve discrete mathematical problems arising throughout their university education and in their professional future.

Many topics can be included within the field of Discrete Mathematics. For example, topics related to set theory, basic logic, proof techniques, the basics of counting, integer modular arithmetic, graphs, trees or discrete probability. Some of these topics can also be classified within other disciplines or subjects. For example, concepts related to set theory can be part of Algebra, basic logic and proof techniques belong to Logic when it is considered as a discipline, and discrete probability may be considered a discipline by itself. This has led us to include concepts related to Graphs and Integer Modular Arithmetic in this subject.

## Course content (verified by ANECA in official undergraduate and Master's degrees) for academic year {0}

### General Competences (CG)

- **CG1** : Capacitat per a resoldre els problemes matemàtics que es poden plantejar en l'enginyeria. Aptitud per a aplicar els coneixements sobre àlgebra lineal, càlcul diferencial i integral, mètodes numèrics, algorísmica numèrica, estadística i optimització.
- **CG3** : Capacitat per a comprendre i dominar els conceptes bàsics de matemàtica discreta, lògica, algorísmica i complexitat computacional, i la seua aplicació per a la resolució de problemes propis de l'enginyeria.

### Exclusive skill taught in this course

No data

### Learning outcomes (Training objectives)

No data

### Specific objectives stated by the academic staff for academic year 2024-25

- To acquire basic knowledge and techniques in order to learn and develop new methods and technologies, as well as skills to face new situations.
- To develop the ability of solving problems through one's own initiative, informed decision-making, autonomy and creativity. Ability to communicate knowledge, capabilities and skills related to the Computer Engineer profession.
- To improve formal reasoning skills acquisition and mathematical knowledge.
- To create a habit of raising questions. To develop a the habit of formulating questions as a way to acquire problem-solving skills: Can the problem be solved? How many solutions are there? What is the relationship between them? What would happen if certain aspects of the problem changed?
- To know and understand basic concepts, results, methods, vocabulary and notation associated with Discrete Mathematics.
- To understand that although the content of this subject is mathematical, Discrete Mathematics has many applications in computer science. Hence the importance of motivating students using the subject's concrete problems and applications.

## Content and bibliography

### Content for academic year 2024-25

- **Lesson 1: "Fundamentals of Graphs"**. Definition and Graph Terminology. Special Types of Graphs. Vertex Degree. Paths and Connectedness. Graph Isomorphism. Matrix representation.
- **Lesson 2: "Accessibility and Connectivity"**. Accessibility. Computation of the Connected Components. Euler trails and Euler tours. Hamilton paths and Hamilton cycles.
- **Lesson 3: "Trees"**. Definitions, Properties, and Examples. Rooted Trees. Tree Traversal.
- **Lesson 4: "Weighted Graphs"**. Definition and Examples. Shortest-Path. Acyclic Graphs. Critical Path Method. Dijkstra's Shortest-Path Algorithm. Floyd-Warshall's Method. Minimum spanning trees.
- **Lesson 5: "The Integers"**. Axiomatic construction of the Integers. The Well-Ordering Principle. Divisibility. Greatest Common Divisor and Least Common Multiple. Primes. Factorization.
- **Lesson 6: "Modular Arithmetic"**. Congruences. The Integers Modulo  $n$ . Arithmetic in the set of Integers Modulo  $n$ . Invertible elements. Euler's phi function. Applications of Congruences: Cryptography.

## Related links

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<https://web.ua.es/magrada/>

Software MaGraDa (Grafos para Matemática Discreta)

### Discrete mathematics

**Author(s):** Dierker, Paul F. ; Voxman, Williem L.

**Issue:** San Diego : Harcourt Brace Jovanovich, 1986;

**ISBN:** 0-15-517691-9

**Category:** Sin especificar

### Estructuras de matemáticas discretas para la computación

**Author(s):** Kolman, Bernard ; Busby, Robert C.

**Issue:** México : Prentice-Hall Hispanoamericana, 1997;

**ISBN:** 968-880-799-0

**Category:** Sin especificar

### Graph theory with applications

**Author(s):** Bondy, J. A. (John Adrian)

**Issue:** London : Macmillan Press, 1976;

**ISBN:** 0333177916

**Category:** Sin especificar

### Matemática discreta

**Author(s):** Biggs, Norman L.

**Issue:** Barcelona : Vicens Vives, 1994;

**ISBN:** 84-316-3311-5

**Category:** Sin especificar

### Matemática discreta

**Author(s):** Migallón Gomis, Violeta ; Penadés Martínez, José

**Issue:** San Vicente del Raspeig : Universidad de Alicante, 2004;

**ISBN:** 978-84-95434-24-1

**Category:** Sin especificar

**Matemáticas discreta y combinatoria : una introducción con aplicaciones**

**Author(s):** Grimaldi, Ralph P.

**Issue:** México : Addison-Wesley Longman, 1998;

**ISBN:** 968-444-324-2

**Category:** Sin especificar

**Matemáticas discretas**

**Author(s):** Johnsonbaugh, Richard

**Issue:** Naucalpan de Juárez : Pearson Education, 2005;

**ISBN:** 970-26-0637-3

**Category:** Sin especificar

**Matemáticas discretas**

**Author(s):** Lipschutz, Seymour

**Issue:** México : McGraw-Hill Interamericana, 2009;

**ISBN:** 978-970-10-7236-3

**Category:** Sin especificar

**Matemáticas discretas**

**Author(s):** Ross, Kenneth A. ; Wright, Charles R.B.

**Issue:** México : Prentice-Hall Hispanoamericana, 1990;

**ISBN:** 968-880-180-1

**Category:** Sin especificar

**Matemáticas discretas: con teoría de gráficas y combinatoria**

**Author(s):** Veerarajan, T.

**Issue:** México : McGraw-Hill Interamericana, 2008;

**ISBN:** 978-970-10-6530-3

**Category:** Sin especificar

## Prácticas de matemática discreta con MaGraDa

**Author(s):** Caballero Palomino, Miguel Angel ; Migallón Gómis, Violeta

**Issue:** Alicante : Publicaciones de la Universidad de Alicante, 2001;

**ISBN:** 84-7908-641-6

**Category:** Sin especificar

## Assessment

### Assessment procedures and criteria 2024-25

The evaluation of the subject will make of continuous form, evaluating the following appearances:

Two different aspects will be assessed by the teacher:

- Theoretical-practical knowledge of the subject. To evaluate this knowledge a final exam will be held at the end of the course. This exam will be worth 10 points. NT will denote the mark of this exam.
- Practical knowledge of the subject. This assessment has two parts. The first part, denoted by NP1 out of 10 points, is the weighted average score of all exams and questionnaires of Moodle held during the practical sessions. The second part, denoted by NP2 out of 10 points, is based on student attitude in practical classes. Assessment criteria: meeting deadlines, class attendance, etc. To obtain these points, must attend at least 10 practical classes.

NP will denote the mark of this practical knowledge and will be computed as

$$NP = 0.90 * NP1 + 0.10 * NP2$$

After examining these aspects, the final grade will be calculated as follows:

- If  $NT \geq 4$ , then the final grade will be:

$$0.5 * NT + 0.5 * NP, \text{ independently of the grade obtained in the practical sessions.}$$

- If  $NT < 4$ , then the final grade will be fail with numerical mark equal to

$$\text{MIN}(NT, 0.5 * NT + 0.5 * NP).$$

The practical sessions grade (NP), obtained during the course, will be valid not only for the first call (C3) corresponding to the academic year in which that grade was obtained, but also for the second call (C4) or even, in its case, for the extraordinary call, as long as the student decides so. Students who do not wish to keep the practical grade obtained during the development of the course (including those who have not completed the practicals) must present their practices on the day of the exam of the corresponding call to the teacher of the theory group to which they belong. In these cases, the practices to be delivered consist of all the practice material, not only those developed during the course. The NP grade will be established based on this material. Note that this procedure is NOT valid for the first call (C3) in which the practical grade will be exclusively the one obtained during the course.

Description	Criteria	Type	Weighting system
<p>The assessment of this knowledge consists of two parts. The first part consists of the average score of the exams held in the practical classes and Moodle quizzes (NP1 out of 10 points). The second part, denoted by NP2 out of 10 points, is based on student attitude in practical classes. Assessment criteria: meeting deadlines, class attendance, etc. NP will be the practical knowledge mark, and will be calculated as</p>	<p>Practical knowledge of the subject</p>	<p>ACTIVITIES OF EVALUATION DURING THE SEMESTER</p>	<p>50</p>
<p><math>NP = 0.90 * (NP1: \text{weighted average score of exams and quizzes on a 10-point scale}) + 0.10 * (NP2, \text{out of 10 points})</math></p>			

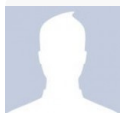
In order to assess this knowledge, a final exam will be held at the end of the course.

Theoretical-practical knowledge of the FINAL TEST 50

## Official exam dates for academic year 2024-25

Exam session	Date	Time	Group - Classroom(s) allocated	Comments
(C3) Periodo ordinario para asignaturas de segundo semestre y anuales	02/06/2025			Teoría
(C4) Pruebas extraordinarias para asignaturas de grado y máster	15/07/2025			Teoría

## Academic staff



### **PENADES MARTINEZ, JOSE LEANDRO**

Lecturer responsible

THEORY CLASS: Groups: 3 , 40

COMPUTER PRACTICALS: Groups: 05



### **ALFONSO GALIPIENSO, MARIA ISABEL**

COMPUTER PRACTICALS: Groups: 01 , 10



### **ARNAL GARCIA, JOSE**

THEORY CLASS: Groups: 2

COMPUTER PRACTICALS: Groups: 04





**BOTIA MARTINEZ, ANTONIO**

THEORY CLASS: Groups: 1  
COMPUTER PRACTICALS: Groups: 03



**MARTINEZ MARIN, JUAN ANTONIO**

COMPUTER PRACTICALS: Groups: 07



**PEREZ BELTRAN, JORGE RAMON**

COMPUTER PRACTICALS: Groups: 06 , 08 , 12

## Groups

### THEORY CLASS

Group	Semester	Morning or afternoon session	Language	No. of enrolled students	
Gr. 1 (THEORY CLASS) : 1	2S	Morning	Spanish	76	▪ Allowed DEGREE IN COMPUTER ENGINEERING
Gr. 2 (THEORY CLASS) : 2 (ARA)	2S	Morning	English	14	▪ Allowed DEGREE IN COMPUTER ENGINEERING
Gr. 3 (THEORY CLASS) : 3 VAL	2S	Morning	Valencian	21	▪ Allowed DEGREE IN COMPUTER ENGINEERING
Gr. 4 (THEORY CLASS) : 4	2S	Afternoon	Spanish	97	▪ Allowed DEGREE IN COMPUTER ENGINEERING
Gr. 40 (THEORY CLASS) : 40 I2ADE	2S	Morning	Spanish	32	▪ Allowed DOUBLE DEGREE IN COMPUTER ENGINEERING AND BUSINESS ADMINISTRATION ▪ Allowed VISITING STUDENT NO EEES ▪ Allowed VISITING STUDENT EEES ▪ Allowed INTERNATIONAL MOBILITY PROGRAMME
Gr. 5 (THEORY CLASS) : 5	2S	Morning	Spanish	76	▪ Allowed DEGREE IN COMPUTER ENGINEERING







### COMPUTER PRACTICALS

Group	Semester	Morning or afternoon session	Language	No. of enrolled students	
Gr. 01 (COMPUTER PRACTICALS) : 1	2S	Morning	Spanish	25	▪ Allowed DEGREE IN COMPUTER ENGINEERING
Gr. 02 (COMPUTER PRACTICALS) : 2	2S	Morning	Spanish	25	▪ Allowed DEGREE IN COMPUTER ENGINEERING
Gr. 03 (COMPUTER PRACTICALS) : 3	2S	Morning	Spanish	26	▪ Allowed DEGREE IN COMPUTER ENGINEERING
Gr. 04 (COMPUTER PRACTICALS) : 4 (ARA)	2S	Morning	English	14	▪ Allowed DEGREE IN COMPUTER ENGINEERING
Gr. 05 (COMPUTER PRACTICALS) : 5 VAL	2S	Morning	Valencian	21	▪ Allowed DEGREE IN COMPUTER ENGINEERING












<b>Group</b>	<b>Semester</b>	<b>Morning or afternoon session</b>	<b>Language</b>	<b>No. of enrolled students</b>	
Gr. 06 (COMPUTER PRACTICALS) : 6	2S	Afternoon	Spanish	24	<ul style="list-style-type: none"> <li>▪ Allowed DEGREE IN COMPUTER ENGINEERING</li> </ul>
Gr. 07 (COMPUTER PRACTICALS) : 7	2S	Afternoon	Spanish	30	<ul style="list-style-type: none"> <li>▪ Allowed DEGREE IN COMPUTER ENGINEERING</li> </ul>
Gr. 08 (COMPUTER PRACTICALS) : 8	2S	Afternoon	Spanish	26	<ul style="list-style-type: none"> <li>▪ Allowed DEGREE IN COMPUTER ENGINEERING</li> </ul>
Gr. 09 (COMPUTER PRACTICALS) : 9	2S	Morning	Spanish	30	<ul style="list-style-type: none"> <li>▪ Allowed DEGREE IN COMPUTER ENGINEERING</li> </ul>
Gr. 10 (COMPUTER PRACTICALS) : 10	2S	Morning	Spanish	28	<ul style="list-style-type: none"> <li>▪ Allowed DEGREE IN COMPUTER ENGINEERING</li> </ul>
Gr. 11 (COMPUTER PRACTICALS) : 11	2S	Morning	Spanish	19	<ul style="list-style-type: none"> <li>▪ Allowed DEGREE IN COMPUTER ENGINEERING</li> </ul>
Gr. 12 (COMPUTER PRACTICALS) : 12	2S	Afternoon	Spanish	16	<ul style="list-style-type: none"> <li>▪ Allowed DEGREE IN COMPUTER ENGINEERING</li> </ul>
Gr. 401 (COMPUTER PRACTICALS) : 40 I2ADE	2S	Morning	Spanish	29	<ul style="list-style-type: none"> <li>▪ Allowed VISITING STUDENT EEES</li> <li>▪ Allowed INTERNATIONAL MOBILITY PROGRAMME</li> <li>▪ Allowed VISITING STUDENT NO EEES</li> <li>▪ Allowed DOUBLE DEGREE IN COMPUTER ENGINEERING AND BUSINESS ADMINISTRATION</li> </ul>
Gr. 402 (COMPUTER PRACTICALS) : 402 I2ADE	2S	Morning	Spanish	3	

## Timetables



### THEORY CLASS

Group	Start date	End date	Day	Start time	End time	Lecture room
1	27/01/2025	23/05/2025	MAR	09:00	11:00	A3/0006 
2	27/01/2025	23/05/2025	MAR	09:00	11:00	A3/0005 
3	27/01/2025	23/05/2025	LUN	09:00	11:00	A3/0011 
4	27/01/2025	23/05/2025	LUN	15:00	17:00	A3/0006 
40	27/01/2025	23/05/2025	MIE	13:00	15:00	A2/E01 
5	27/01/2025	23/05/2025	LUN	11:00	13:00	A3/0005 

### COMPUTER PRACTICALS

Group	Start date	End date	Day	Start time	End time	Lecture room
01	27/01/2025	23/05/2025	VIE	13:00	15:00	0039PB010 
02	27/01/2025	23/05/2025	MIE	11:00	13:00	0039PS002 
03	27/01/2025	23/05/2025	MAR	11:00	13:00	0039PB010 
04	27/01/2025	23/05/2025	MAR	11:00	13:00	0039PB055 
05	27/01/2025	23/05/2025	LUN	11:00	13:00	0039PS045 
06	27/01/2025	23/05/2025	JUE	19:00	21:00	0039PS002 
07	27/01/2025	23/05/2025	LUN	17:00	19:00	0039PB010 
08	27/01/2025	23/05/2025	JUE	17:00	19:00	0039PS002 
09	27/01/2025	23/05/2025	LUN	13:00	15:00	0039PS002 
10	27/01/2025	23/05/2025	VIE	11:00	13:00	0039PS002 
11	27/01/2025	23/05/2025	MIE	09:00	11:00	0039PB055 

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<b>Group</b>	<b>Start date</b>	<b>End date</b>	<b>Day</b>	<b>Start time</b>	<b>End time</b>	<b>Lecture room</b>
12	27/01/2025	23/05/2025	LUN	19:00	21:00	<a href="#">0039PS045</a> 
401	27/01/2025	23/05/2025	MAR	13:00	15:00	<a href="#">0016P1006</a> 
402	27/01/2025	23/05/2025	MAR	13:00	15:00	<a href="#">0016P1002</a> 