UNIVERSIDAD DE CASTILLA - LA MANCHA

GUÍA DOCENTE

1. General information

Course:	ALGEBRA AND DISCRETE MATHEMATICS	**Code:**	42305
Type:	BASIC	**ECTS credits:**	6
Degree:	407 - DEGREE PROGRAMME IN COMPUTER SCIENCE ENGINEERING	**Academic year:**	2020-21
Center:	108 - SCHOOL OF COMPUTER SCIENCE OF C. REAL	**Group(s):**	23 20 21 22
Year:	1	**Duration:**	C2
Main language:	English	**Second language:**	
Use of additional languages:		**English Friendly:**	N
Web site:		**Bilingual:**	Y

Lecturer: **JOSE LUIS ESPINOSA ARANDA** - Group(s): **23 20**

Building/Office	Department	Phone number	Email	Office hours
Laboratorio 1.09.2 (Edificio Politécnico)	MATEMÁTICAS		JoseL.Espinosa@uclm.es	

Lecturer: **RICARDO GARCIA RODENAS** - Group(s): **23 20 21 22**

Building/Office	Department	Phone number	Email	Office hours
FERMIN CABALLERO 2.20	MATEMÁTICAS	926052781	ricardo.garcia@uclm.es	https://esi.uclm.es/categories/profesorado-y-tutorias

Lecturer: **JESUS JAVIER ORTEGA TRIGUERO** - Group(s): **23 20 21 22**

Building/Office	Department	Phone number	Email	Office hours
Fermín Caballero/2.17	MATEMÁTICAS	3719	jesusjavier.ortega@uclm.es	https://esi.uclm.es/categories/profesorado-y-tutorias

2. Pre-Requisites

The pre-requisites for the successful completion of this subject do not go beyond the skills in Linear Algebra acquired at High School. In particular, it is desirable for students to know the basic tools and methods required for matrix calculus and for the resolution of linear equation systems. For students presenting difficulties in these areas, it is recommended they attend the Zero Course organized by the College at the beginning of the first semester.

3. Justification in the curriculum, relation to other subjects and to the profession

The subjects Algebra and Discrete Mathematics, Calculus and Numerical Methods, Statistics, and Logic conform the Mathematical Foundations of Computer Science, which is included in the basic training module of the Computer Science curriculum. Algebra and Discrete Mathematics, as its name indicates, dedicates its credits to the formation of the future engineer in these mathematical areas, which serve as a basis for the correct understanding and development of other curriculum subjects. Likewise, the subject contributes to the student's training in transversal competences, but not less important.

In the study of algorithmic processes to analyze information (its theory, design, effectiveness and implementation), the computer scientist needs certain mathematical tools (concepts, results and basic techniques) which are provided in this course. At the same time, the study of these tools provides the student with certain fundamental skills such as rigorousness, the capacity to use a formal language and a logical structure (which are unambiguous and syntactically coherent), as well as the mastery of deduction and induction processes. To this end, the learning is combined with the acquisition of transversal skills, such as the ability to use mathematical reasoning and logical deduction or the stimulation of intuition when using mathematical concepts, results and methods.

The lessons in Discrete Mathematics, at least those related to Boolean Algebras, Graph Theory and Finite Groups (which are a good part of those developed in the program) are essential because they are linked to the development of computer concepts and technologies. Specifically, computers are finite structures, inherent to Discrete Mathematics, so that their understanding would be impossible without a prior learning of the topics of this area. It is enough to think that internally computers work with lists of zeros and ones (whose basic structure is Boolean algebra), that every time we start a computer session and we open tabs we are using a tree graph, or that modular arithmetic operates on finite groups. Furthermore, the study of abstract data types requires algebraic analysis of the properties of certain operations defined on a certain set. On the other hand, Linear Algebra constitutes an elementary theoretical base in which multiple problems of different sciences are formalized and solved. The applications of Linear Algebra to Computer Science are diverse and highly relevant, such as the use of matrix calculation in coding theory or the identification and classification of transformations in computer graphics.

The course prepares the student to use formal language, an essential aspect of computer science and implicitly present in most of the subjects of the degree. It also provides the student with logical structures of reasoning, which are equally useful in most subjects. Regarding the contents, besides the above mentioned, the course is closely related to Computer Technology (which makes use of the Boolean algebra structure for the study of switching circuits), Physical Foundations, and Calculus and Numerical Methods (which make use of the resolution -algebraic and numerical- of linear equation systems).

Because this is a basic subject in the degree, its contribution is directly focused on the training of the engineer in the aspects previously described. Therefore, It will be implicit in many activities throughout the career development, even if it is not generally explicit.

4. Degree competences achieved in this course

Course competences

Code	Description
BA01	Ability to solve mathematical problems which can occur in engineering. Skills to apply knowledge about: lineal algebra; integral and differential calculus; numerical methods, numerical algorithms, statistics, and optimization.

BA03	Ability to understand basic concepts about discrete mathematics, logic, algorithms, computational complexity, and their applications to solve engineering problems.
INS02	Organising and planning skills.
INS03	Ability to manage information and data.
INS05	Argumentative skills to logically justify and explain decisions and opinions.
SIS09	Care for quality.
UCLM03	Accurate speaking and writing skills.

5. Objectives or Learning Outcomes

Course learning outcomes

Description

Use of basic concepts of lineal and combinational algebra.

Application of graph theory fundamentals to the modelling and mathematical resolution of real problems.

Utilization of programs for symbolic and numerical calculus.

6. Units / Contents

Unit 1: Sets, Functions and Relations

Unit 2: Counting

Unit 3: Arithmetic

Unit 4: Graphs

Unit 5: Introduction to linear algebra

ADDITIONAL COMMENTS, REMARKS

MATLAB is used in the laboratory sessions.

7. Activities, Units/Modules and Methodology

Training Activity	Methodology	Related Competences (only degrees before RD 822/2021)	ECTS	Hours	As	Com	Description
Class Attendance (theory) [ON-SITE]	Lectures	BA01 BA03	0.9	22.5	N	-	Lectures about the syllabus. (MAG)
Individual tutoring sessions [ON-SITE]		BA01 BA03	0.18	4.5	N	-	Individual or small group tutorials in the teacher's office, classroom or laboratory. (TUT)
Study and Exam Preparation [OFF-SITE]	Self-study	BA01 BA03 INS02 INS03	2.1	52.5	N	-	Individual study of the student. (EST)
Other off-site activity [OFF-SITE]	Practical or hands-on activities	INS02 INS03	0.6	15	N	-	Preparation for the subject's practice sessions. (PLAB)
Problem solving and/or case studies [ON-SITE]	Problem solving and exercises	BA01 BA03 INS02 INS03 INS05 SIS09 UCLM03	0.6	15	Y	N	Resolution of exercises by the teacher and students. (PRO)
Writing of reports or projects [OFF-SITE]	Self-study	BA01 BA03 INS02 INS03 INS05 SIS09	0.9	22.5	Y	N	Preparation of a report on a topic proposed by the teacher. (RES)
Computer room practice [ON-SITE]	Practical or hands-on activities	BA01 BA03 INS02 INS03 INS05 SIS09 UCLM03	0.42	10.5	Y	Y	Conducting the scheduled practices in the computer room. (LAB)
Final test [ON-SITE]	Assessment tests	BA01 BA03 INS05 SIS09 UCLM03	0.3	7.5	Y	Y	Taking a final exam of the entire subject. (EVA)
		Total:	**6**	**150**			
		Total credits of in-class work: 2.4					**Total class time hours: 60**
		Total credits of out of class work: 3.6					**Total hours of out of class work: 90**

As: Assessable training activity

Com: Training activity of compulsory overcoming (It will be essential to overcome both continuous and non-continuous assessment).

8. Evaluation criteria and Grading System

Evaluation System	Continuous assessment	Non-continuous evaluation*	Description
Final test	55.00%	55.00%	Compulsory activity that can be retaken (rescheduling) to be carried out within the planned exam dates of the final exam call (convocatoria ordinaria).
Theoretical papers assessment	20.00%	20.00%	Non-compulsory activity that can be retaken. To be carried out before end of teaching period.
Laboratory sessions	15.00%	15.00%	Compulsory activity that can be retaken. To be carried out during lab sessions.
Oral presentations assessment	10.00%	10.00%	Non-compulsory activity that can be retaken.
Total:	**100.00%**	**100.00%**	

According to art. 4 of the UCLM Student Evaluation Regulations, it must be provided to students who cannot regularly attend face-to-face training activities the passing of the subject, having the right (art. 12.2) to be globally graded, in 2 annual calls per subject , an ordinary and an extraordinary one (evaluating 100% of the competences).

Evaluation criteria for the final exam:

Continuous assessment:

In compulsory activities, a minimum mark of 40% is required in order to pass that activity and have the possibility to therefore pass the entire subject. The evaluation of the activities will be global and therefore must be quantified by means of a single mark. If the activity consists of several sections, each section may be evaluated separately provided students are informed in writing of this evaluation criterion at the beginning of the academic year. In the case of the activities that may be retaken (i.e., rescheduling), an alternative activity or test will be offered in the resit/retake exam call (convocatoria extraordinaria).

The final exam will be common for all the theory/laboratory groups of the subject and will be evaluated by the lecturers of the subject in a serial way, i.e., each part of the final exam will be evaluated by the same lecturer for all the students.

A student is considered to pass the subject if she/he obtains a minimum of 50 points out of 100, taking into account the points obtained in all the evaluable activities, and also has passed all the compulsory activities.

For students who do not pass the subject in the final exam call (convocatoria ordinaria), the marks of activities already passed will be conserved for the resit/retake exam call (convocatoria extraordinaria). The oral presentations assessment (non-recoverable activity) will be conserved for the resit/retake exam call even if it has not been passed. In the case of the passed recoverable activities, the student will have the opportunity to receive an alternative evaluation of those activities in the resit/retake exam call and, in that case, the final grade of the activity will correspond to the latter grade obtained.

The mark of the passed activities in any call, except for the final exam, will be conserved for the subsequent academic year at the request of the student, provided that mark is equal or greater than 50% and that the activities and evaluation criteria of the subject remain unchanged prior to the beginning of that academic year.

The failure of a student to attend the final exam will automatically result in her/him receiving a "Failure to attend¿ (no presentado). If the student has not passed any compulsory evaluation activity, the maximum final grade will be 40%.

Non-continuous evaluation:

Students who are unable to attend training activities on a regular basis may apply at the beginning of the semester for the non-continuous assessment mode. Similarly, if a student who is undergoing continuous assessment incurs any circumstance that prevents her/him from regularly attending the classroom-based training activities, she/he may renounce the accumulated mark in continuous assessment and apply for the non-continuous assessment mode. In this case, a notification by the student must be given before the date scheduled for the tests in the ordinary call, in accordance with a deadline that will be informed at the beginning of the semester.

Students who take the non-continuous assessment mode will be globally graded, in 2 annual calls per subject , an ordinary and an extraordinary one (evaluating 100% of the competences), through the assessment systems indicated in the column "Non-continuous assessment".

In the "non-continuous assessment" mode, it is not compulsory to keep the mark obtained by the student in the activities or tests (progress test or partial test) taken in the continuous assessment mode.

Specifications for the resit/retake exam:

Evaluation tests will be conducted for all recoverable activities.

Specifications for the second resit / retake exam:

Same characteristics as the resit/retake exam call.

9. Assignments, course calendar and important dates

Not related to the syllabus/contents	
Hours	**hours**
Individual tutoring sessions [PRESENCIAL][]	4.5
Study and Exam Preparation [AUTÓNOMA][Self-study]	52.5
Other off-site activity [AUTÓNOMA][Practical or hands-on activities]	15
Writing of reports or projects [AUTÓNOMA][Self-study]	22.5
Computer room practice [PRESENCIAL][Practical or hands-on activities]	10.5
Final test [PRESENCIAL][Assessment tests]	7.5
Unit 1 (de 5): Sets, Functions and Relations	
Activities	**Hours**
Class Attendance (theory) [PRESENCIAL][Lectures]	4.5
Problem solving and/or case studies [PRESENCIAL][Problem solving and exercises]	3
Unit 2 (de 5): Counting	
Activities	**Hours**
Class Attendance (theory) [PRESENCIAL][Lectures]	4.5
Problem solving and/or case studies [PRESENCIAL][Problem solving and exercises]	3
Unit 3 (de 5): Arithmetic	
Activities	**Hours**
Class Attendance (theory) [PRESENCIAL][Lectures]	4.5
Problem solving and/or case studies [PRESENCIAL][Problem solving and exercises]	3
Unit 4 (de 5): Graphs	
Activities	**Hours**
Class Attendance (theory) [PRESENCIAL][Lectures]	4.5
Problem solving and/or case studies [PRESENCIAL][Problem solving and exercises]	3
Unit 5 (de 5): Introduction to linear algebra	
Activities	**Hours**
Class Attendance (theory) [PRESENCIAL][Lectures]	4.5
Problem solving and/or case studies [PRESENCIAL][Problem solving and exercises]	3
Global activity	
Activities	**hours**
Class Attendance (theory) [PRESENCIAL][Lectures]	22.5
Individual tutoring sessions [PRESENCIAL][]	4.5
Study and Exam Preparation [AUTÓNOMA][Self-study]	52.5

Other off-site activity [AUTÓNOMA][Practical or hands-on activities]		15
Problem solving and/or case studies [PRESENCIAL][Problem solving and exercises]		15
Writing of reports or projects [AUTÓNOMA][Self-study]		22.5
Computer room practice [PRESENCIAL][Practical or hands-on activities]		10.5
Final test [PRESENCIAL][Assessment tests]		7.5
	Total horas:	150

10. Bibliography and Sources

Author(s)	Title/Link	Publishing house	Citv	ISBN	Year	Description
N.L. Biggs.	Matemática Discreta.	Vicens Vives.	Barcelona	9788431633110	1998	
K.H. Rosen	Matemática Discreta y sus Aplicaciones.	McGRaw-Hill	Madrid	8448140737	2004	
R. Johnsonbaugh	Matemáticas Discretas	Pearson Educación	México	9701702530	2005	
R.P. Grimaldi	Matemática Discreta y Combinatoria.	Prentice Hall	México	9701702530	1999	
K.H. Rosen	Discrete Mathematics and its Applications	Mc Graw-Hill		978-1-259-67651-2	2019	8th edition.