UNIVERSIDAD DE CASTILLA - LA MANCHA

GUÍA DOCENTE

1. General information

Course: ALGEBRA AND DISCRETE MATHEMATICS
Code: 42305
Type: BASIC
ECTS credits: 6
Degree: 405 - DEGREE IN COMPUTER SCIENCE ENGINEERING (TA)
Academic year: 2020-21
Center: 15 - FACULTY OF SOCIAL SCIENCES AND INFORMATION TECHNOLOGIES
Group(s): 60
Year: 1
Duration: C2
Main language: Spanish
Second language:
Use of additional languages:
English Friendly: Y
Web site:
Bilingual: N

Lecturer: **PHILIPP MANFRED GETTO ---** - Group(s): **60**

Building/Office	Department	Phone number	Email	Office hours
1.15	MATEMÁTICAS		Philipp.Getto@uclm.es	

Lecturer: **ALVARO MARTINEZ PEREZ** - Group(s): **60**

Building/Office	Department	Phone number	Email	Office hours
Despacho 2.9	ANÁLISIS ECONÓMICO Y FINANZAS	926051370	alvaro.martinezperez@uclm.es	First semester: Tuesdays from 9 to 11 and from 16 to 18. Fridays from 9 to 11 and from 14 to 15. Second semester: Thursday from 9:30 to 11:30 and from 16 to 18 and Fridays from 9 to 11 and from 15 to 17.

2. Pre-Requisites

The pre-requisites to succesfully take this course do not exceed the competences adquired in previous educational stages on Linear Algebra. In partular, it is desirable to have the basic tools of matricial calculus and resolution of systems of linear equations.

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

The courses on Algebra and Discrethe Mathematics, Calculus and Numerical Methods, Statistics and Logic conform the subject of Mathematical Fundamentals of Informatics, which is included in the basic formation module of the curriculum for the degree in informatic Engineering. Algebra and Discrete Mathematicas is dedicated to the academic training of the future informatic engineer in these areas of mathematics wich are the starting point for developing other subjects in the curriculum. Moreover, this course contributes to the training in also important transversal competences.

In the study of algorithmic proccesses analyzing information (their theory, design, eficiency and implementation), the informatic engineer needs some mathematic tools (concepts, results and basic techniques) that are provided in this course. Also, its study supplies the student certain fundamental capacities as the rigour, the use of a formal language and logical structure (without ambiguitiy and sintactically coherent), as well as the knowledge of processes of deduction and induction. To achieve this, the learning of the contents is combined with the adquisition of transversal competences as the capacity for using mathematical reasoning and logical deduction or the use of intuition when mathematical methods and results are employed.

The contents of Discrete Mathematics, at least those relative to Boole Algebras, Graph Theory and Finite Groups (which are a main part of the program) will be necessary since they are linked to the development of informatical concepts and techniques. In particular, computers are finite structures, those studied by Discrete Mathematics. Therefore, its understanding would be impossible without a previous learning of the topics in this area. It suffices to think that internally, computers work with lists of zeros and ones (whose basic structure is Boole algebra), that every time we iniciate a session in our computer and start opening windows we are using a tree graph or that the modular arithmetic operates on finite gropus (and fields). Moreover, the study of abstract data types demands the algebraic analysis of the properties of certain operations defined on certain set. Also, Linear Algebra is a basis elementary theoretical frame in wich multiple problems on different sciences are modelled and solved. Applications of Linear Algebra to Informatics are diverse and of great importance, as the use of matricial calculus in codification theory or the identification and classification of transformations in graphic informatics.

The course trains the student in the use of formal language, essential aspect in informatics and, implicitly, it is present in the main part of the degree subjects. Also it provides the student reasoning logic structures which are also useful in most of the subjects. Regarding the contents, apart from the above, the subject is directly related to Computers technology (which uses Boole algebra for the study of commutation circuits), Physics Fundamentls and Calculus and Numerical Methods (which use the resolution -algebraic and numeric- of systems of linear equations).

Being a basic subject in the degree, its contribution is directed to the training of the future engineer in the aspects mentioned above. Therefore, in the developement of the profession will be implicit in many acitivities althogh in general it may not appear in an explicit way.

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

Utilization of programs for symbolic and numerical calculus.

Use of basic concepts of lineal and combinational algebra.

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

6. Units / Contents

Unit 1: SETS, RELATIONS AND GRAPHS

Unit 2: COMBINATORICS

Unit 3: BOOLE ALGEBRAS

Unit 4: GRAPHS

Unit 5: ARITHMETIC

Unit 6: INTRODUCTION TO LINEAR ALGEBRA

ADDITIONAL COMMENTS, REMARKS

Laboratory practices:

1. Introduccion to MAXIMA

2. Numbers and functions.

3. Lists and Matrices.

4. Program in MAXIMA.

5. Sets and Combinatorics.

6. Graphs.

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 INS05 UCLM03	0.9	22.5	N	-	Teaching of the subject matter by lecturer (MAG)
Individual tutoring sessions [ON-SITE]		BA01 BA03 INS05 UCLM03	0.18	4.5	N	-	Individual or small group tutoring in lecturer's office, classroom or laboratory (TUT)
Study and Exam Preparation [OFF-SITE]	Self-study	BA01 BA03 INS02 INS03 INS05 SIS09 UCLM03	2.1	52.5	N	-	Self-study (EST)
Other off-site activity [OFF-SITE]	Practical or hands-on activities	BA01 BA03 INS03 SIS09	0.6	15	N	-	Lab practical preparation (PLAB)
Writing of reports or projects [OFF-SITE]	Self-study	BA01 BA03 INS02 INS03 INS05 SIS09 UCLM03	0.9	22.5	Y	N	Preparation of essays on topics proposed by lecturer (RES)
Computer room practice [ON-SITE]	Practical or hands-on activities	BA01 BA03 INS03 SIS09	0.42	10.5	Y	Y	Realization of practicals in laboratory /computing room (LAB)
Problem solving and/or case studies [ON-SITE]	Problem solving and exercises	BA01 BA03 INS05 UCLM03	0.6	15	Y	N	Worked example problems and cases resolution by the lecturer and the students (PRO)
Final test [ON-SITE]	Assessment tests	BA01 BA03 INS05 UCLM03	0.3	7.5	Y	Y	Final test of the complete syllabus of the 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	15.00%	15.00%	Non-compulsory activity that can be retaken. To be carried out before end of teaching period
			Compulsory activity that can be retaken. To be carried out

Laboratory sessions	20.00%	20.00%	during lab sessions
Assessment of active participation	10.00%	10.00%	Non-compulsory activity that can be retaken. To be carried out during the theory/lab sessions for the students following continuous assessment. For those students with non-continuous evaluation this activity will be evaluated through an alternative method in the ordinary call (convocatoria ordinaria).
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). 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

General comments about the planning: The subject is taught in 3 x 1,5 hour sessions per week. The planning can be modified in the event of unforeseen causes.

Unit 1 (de 6): SETS, RELATIONS AND GRAPHS

Activities	**Hours**
Class Attendance (theory) [PRESENCIAL][Lectures]	3.5
Problem solving and/or case studies [PRESENCIAL][Problem solving and exercises]	2

Unit 2 (de 6): COMBINATORICS

Activities	**Hours**
Class Attendance (theory) [PRESENCIAL][Lectures]	3.5
Problem solving and/or case studies [PRESENCIAL][Problem solving and exercises]	2

Unit 3 (de 6): BOOLE ALGEBRAS

Activities	**Hours**
Class Attendance (theory) [PRESENCIAL][Lectures]	3.5
Problem solving and/or case studies [PRESENCIAL][Problem solving and exercises]	2

Unit 4 (de 6): GRAPHS

Activities	**Hours**
Class Attendance (theory) [PRESENCIAL][Lectures]	4
Problem solving and/or case studies [PRESENCIAL][Problem solving and exercises]	3

Unit 5 (de 6): ARITHMETIC

Activities	**Hours**

Class Attendance (theory) [PRESENCIAL][Lectures]	4
Problem solving and/or case studies [PRESENCIAL][Problem solving and exercises]	3

Unit 6 (de 6): INTRODUCTION TO LINEAR ALGEBRA	
Activities	**Hours**
Class Attendance (theory) [PRESENCIAL][Lectures]	4
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
K.H. Rosen	Matemática Discreta y sus Aplicaciones.	McGRaw-Hill	Madrid	8448140737	2004	
N.L. Biggs.	Matemática Discreta.	Vicens Vives.	Barcelona	9788431633110	1998	
R. Johnsonbaugh	Matemáticas Discretas	Pearson Educación	México	9701702530	2005	
R.P. Grimaldi	Matemática Discreta y Combinatoria.	Prentice Hall	México	9701702530	1999	
	MAXIMA. A Computer Algebra System. http://maxima.sourceforge.net/					Software para prácticas