UNIVERSIDAD DE CASTILLA - LA MANCHA

GUÍA DOCENTE

1. General information

Course: CALCULUS AND NUMERICAL METHODS
Code: 42300
Type: BASIC
ECTS credits: 6
Degree: 406 - UNDERGRADUATE DEGREE IN COMPUTER SCIENCE AND ENGINEERING (AB)
Academic year: 2022-23
Center: 604 - SCHOOL OF COMPUTER SCIENCE AND ENGINEERING (AB)
Group(s): 10 11 12 13
Year: 1
Duration: First semester
Main language: Spanish
Second language: English
Use of additional languages: English in Group 13
English Friendly: N
Web site:
Bilingual: Y

Lecturer: **GUILLERMO MANJABACAS TENDERO** - Group(s): **11 13**

Building/Office	Department	Phone number	Email	Office hours
Infante Don Juan Manuel. Despacho 1.B.4	MATEMÁTICAS	2172	guillermo.manjabacas@uclm.es	

Lecturer: **RAMON SERRANO URREA** - Group(s): **10**

Building/Office	Department	Phone number	Email	Office hours
Infante D. Juan Manuel / 1.B.3	MATEMÁTICAS	2394	Ramon.Serrano@uclm.es	

Lecturer: **ALEJANDRO JOSÉ ZORNOZA MARTÍNEZ** - Group(s): **12**

Building/Office	Department	Phone number	Email	Office hours
Infante Don Juan Manuel / 0.E.5	MATEMÁTICAS		Alejandro.Zornoza@uclm.es	

2. Pre-Requisites

In order to achieve the learning objectives of the subject it is necessary to have a good command of some contents supposed to be studied in a course similar to the second course of Spanish Bachillerato or even previously, such as, basic notions of geometry and trigonometry, elementary calculations (fractions, powers, logarithms), elementary functions and a sound knowledge of differential and integral calculus.

The ESII offers a special course (Seminario de refuerzo de Cálculo) given simultaneously with the subject to help students who may need it.

There are, of course, some online resources that may be helpful as well as some books of Bachillerato level.

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

A computer science engineer needs some mathematical tools to comprehend the proper technics useful for his professional life. Our subject provides some of them.

Another important point is that mathematics helps students to develop the abstraction capacity, the scientific rigour and the analysis and synthesis skills that are helpful for future engineers.

In this subject we include some mathematical background useful for other subjects, such as Fundamentos Físicos de la Informática (Physics for Computer Science), Estadística (Statistics) and Metodología de la programación (Programming methodology).

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.
INS05	Argumentative skills to logically justify and explain decisions and opinions.
PER02	Ability to work in multidisciplinary teams.
PER05	Acknowledgement of human diversity, equal rights, and cultural variety.
UCLM02	Ability to use Information and Communication Technologies.
UCLM03	Accurate speaking and writing skills.

5. Objectives or Learning Outcomes

Course learning outcomes

Description

Resolution of fundamental concepts of derivative and integral.

Enunciation and resolution of optimization problems.
Use of fundamental concepts of derivatives and integrals.
Understanding of the use of induction definition method (recursion) and its particular importance in computer programming.
Implementation and analysis of several numerical methods.
Utilization of programs for symbolic and numerical calculus.

6. Units / Contents

Unit 1: Numbers, sequences and series

Unit 1.1 Numbers. Different sets of numbers and their properties. Principle of mathematical induction.

Unit 1.2 Sequences of real numbers.

Unit 1.3 Series. An introduction.

Unit 2: Differential calculus.

Unit 2.1 Basic concepts: functions, limits and continuity.

Unit 2.2 Differentiation. Basic properties.

Unit 2.3 Applications of the derivative. Maximum and minimum points. Increasing and decreasing functions. Rolle and the mean value theorems. L'Hôpital's rule. Convexity and concavity.

Unit 2.4 Approximation by polynomial functions. Taylor's polynomial and Lagrange's remainder theorem.

Unit 2.5 Approximating the solution of an equation: bisection, Newton and fix point methods.

Unit 2.6 Polynomial interpolation.

Unit 3: Integral calculus.

Unit 3.1 Riemann integral. Definite integral and its properties. Fundamental theorem of calculus.

Unit 3.2 Indefinite integrals. Applications of integrals.

Unit 3.3 Improper integrals. Convergence. Different types of improper integrals.

Unit 3.4 Approximating a definite integral: trapezoid and Simpson rules.

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]	Combination of methods	BA01 BA03 INS05 PER05	1.4	35	N	-	Between 2h and 4h per week in which several teaching methods will be used.
Problem solving and/or case studies [ON-SITE]	Workshops and Seminars	BA01 BA03 INS05 PER02 UCLM03	0.16	4	Y	N	Three problem-solving activities, one per unit, with the possibility of self-assessment as part of the evaluation.
Computer room practice [ON-SITE]	Practical or hands-on activities	BA01 BA03 INS05 UCLM02	0.48	12	Y	N	Laboratory practical sessions with Matlab. Students will take several tests about these sessions
Project or Topic Presentations [ON-SITE]	Practical or hands-on activities	BA01 BA03 INS05 UCLM02 UCLM03	0.08	2	Y	N	A presentation about one laboratory session (groups of 3-4 students). It is compulsory to attend office hours before the presentation in order to check your work.
Writing of reports or projects [OFF-SITE]	Group Work	BA01 BA03 INS05 PER02 UCLM02 UCLM03	0.4	10	Y	N	Each group of students must prepare a presentation with the tutoring help of the lecturer.
Final test [ON-SITE]	Assessment tests	BA01 BA03 INS05 UCLM03	0.2	5	Y	Y	There will be three exams (one per unit). It is compulsory to reach a minimum mark of 4 out of 10 in each exam to pass the course. In the regular/extraordinay exam session you can retake the parts in case you have not reached the minimum mark previously.
Study and Exam Preparation [OFF-SITE]	Combination of methods	BA01 BA03 INS05	3.2	80	N	-	Self-study.
Individual tutoring sessions [ON-SITE]	Other Methodologies	BA01 BA03 INS05 UCLM03	0.08	2	Y	N	Students may ask for help during office hours (6 hours per week). It is compulsory to attend office hours to check the presentation about the laboratory session.
		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
Assessment of problem solving and/or case studies	20.00%	20.00%	Individual activity.
Oral presentations assessment	10.00%	10.00%	Group activity.

Assessment of activities done in the computer labs	15.00%	15.00%	Online tests about the practical sessions.
Mid-term tests	55.00%	55.00%	Individual activity. Three partial exams, one per unit (unit 1: 20%, unit 2: 20% and unit 3: 15%). A minimum mark of 4 in each part is compulsory to pass the course.
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:

All activities will take place during the course and the dates for each one will be announced in advance.

A minimum average mark of 5 out of 10 including all the activities and a minimum mark of 4 out of 10 in each partial test is compulsory to pass the course. Below this minimum, the student will have to take the corresponding parts in the extra exam session. After this, if the student has not reached the minimum mark of 4 in this test, the final grade will be less than or equal to 4 even if the average mark (when considered all the activities) is greater than or equal to 5.

By default, students will follow the continuous assessment. Students who want to switch to the non-continuous assessment must apply through https://www.esiiab.uclm.es/alumnos/evaluacion.php not later than a 50% of the activities in the continuous assessment have been evaluated (the exact date will be announced on Campus Virtual).

Non-continuous evaluation:

Same criteria as in the continuous assessment, but students have to reach the minimum mark of 4 out of 10 in the final exam. In addition, students will take a test about the rest of activities (problem-solving activities, oral presentation and computer tests) during the official period of exams. The percentage of these tests in the overall mark will be the same as in the continuous assessment.

Specifications for the resit/retake exam:

In the resit exam students may choose to retake only the partial tests in which they haven't reached the minimum mark of 4 out of 10. Anyway, this part represents a 55% in the final mark.

With regard to the rest of the evaluation (45%), there will be two options:
Option 1. Students can keep their marks during the course for the laboratory assessment, the oral presentation and the problem solving activities.

Option 2: students repeat all the activities of option 1. In order to organize them, students must inform the lecturer at least 30 days before the official date of the resit exam. All activities must be finished by the date of this official exam. If possible, the oral presentation will be organized in groups.

If a student has not reached the minimum mark of 4 in the test, the final grade will be at most 4.0 even if the average mark (when considered all the activities) is greater than or equal to 5.

Specifications for the second resit / retake exam:

Students must take an examination about all the contents of the course: theory, problems and laboratory sessions.

9. Assignments, course calendar and important dates

Not related to the syllabus/contents

Hours	**hours**
Project or Topic Presentations [PRESENCIAL][Practical or hands-on activities]	2
Writing of reports or projects [AUTÓNOMA][Group Work]	10
Individual tutoring sessions [PRESENCIAL][Other Methodologies]	2

General comments about the planning: This course schedule is APPROXIMATE. It could vary throughout the academic course due to teaching needs, bank holidays, etc. A weekly schedule will be properly detailed and updated on the online platform (Virtual Campus). Note that all the lectures, practice sessions, exams and related activities performed in the bilingual groups will be entirely taught and assessed in English. Classes will be scheduled in 3 sessions of one hour and a half per week.

Unit 1 (de 3): Numbers, sequences and series

Activities	**Hours**
Class Attendance (theory) [PRESENCIAL][Combination of methods]	12
Problem solving and/or case studies [PRESENCIAL][Workshops and Seminars]	1
Computer room practice [PRESENCIAL][Practical or hands-on activities]	4
Final test [PRESENCIAL][Assessment tests]	1
Study and Exam Preparation [AUTÓNOMA][Combination of methods]	25

Teaching period: 5 weeks

Unit 2 (de 3): Differential calculus.

Activities	**Hours**
Class Attendance (theory) [PRESENCIAL][Combination of methods]	12
Problem solving and/or case studies [PRESENCIAL][Workshops and Seminars]	2
Computer room practice [PRESENCIAL][Practical or hands-on activities]	6
Final test [PRESENCIAL][Assessment tests]	2
Study and Exam Preparation [AUTÓNOMA][Combination of methods]	28

Teaching period: 5 weeks

Unit 3 (de 3): Integral calculus.

Activities	**Hours**
Class Attendance (theory) [PRESENCIAL][Combination of methods]	11
Problem solving and/or case studies [PRESENCIAL][Workshops and Seminars]	1
Computer room practice [PRESENCIAL][Practical or hands-on activities]	2
Final test [PRESENCIAL][Assessment tests]	2
Study and Exam Preparation [AUTÓNOMA][Combination of methods]	27

Teaching period: 4 weeks

Global activity	
Activities	**hours**
Individual tutoring sessions [PRESENCIAL][Other Methodologies]	2
Writing of reports or projects [AUTÓNOMA][Group Work]	10
Final test [PRESENCIAL][Assessment tests]	5
Class Attendance (theory) [PRESENCIAL][Combination of methods]	35
Problem solving and/or case studies [PRESENCIAL][Workshops and Seminars]	4
Computer room practice [PRESENCIAL][Practical or hands-on activities]	12
Project or Topic Presentations [PRESENCIAL][Practical or hands-on activities]	2
Study and Exam Preparation [AUTÓNOMA][Combination of methods]	80
Total horas:	150

10. Bibliography and Sources

Author(s)	Title/Link	Publishing house	Citv	ISBN	Year	Description
García, A. et al	Cálculo I : teoría y problemas de análisis matemático en una variable	CLAGSA		978-84-921847-2-9	2007	
Manjabacas, G. et al	Ejercicios de Cálculo II : cálculo diferencial e integral en una variable	Popular Libros		84-932789-8-X	2004	
Manjabacas, G. et al	Ejercicios de cálculo I	Popular Libros		84-932789-0-4	2002	
Burden, R.L. & Faires, J.D.	Análisis numérico	Thomson Learning		970-686-134-3	2003	
García, N. et al	Una invitación al análisis numérico con MATLAB	Popular Libros		84-932789-9-8	2005	
Mathews, John H.	Métodos numéricos con MATLAB	Pearson/Prentice Hall		978-84-8322-181-5	2007	