



1. General information

Course: CALCULUS II

Type: BASIC

Degree: 412 - UNDERGRADUATE DEGREE PROGRAMME IN ELECTRICAL ENGINEERING

Center: 106 - SCHOOL OF MINING AND INDUSTRIAL ENGINEERING

Year: 1

Main language: Spanish

Use of additional languages:

Web site:

Code: 56306

ECTS credits: 6

Academic year: 2022-23

Group(s): 55 56

Duration: C2

Second language:

English Friendly: Y

Bilingual: N

Lecturer: ANGEL ROMERO VILLADA - Group(s): 55				
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2. Pre-Requisites

In order for students to achieve the learning objectives described, they must have knowledge and skills that are supposed to be guaranteed in their training prior to accessing the University:

- Knowledge: basic geometry and trigonometry, basic mathematical operations (powers, logarithms, fractions), polynomials, matrices, derivation, integration and graphic representation of functions.

- Basic skills in the handling of instruments: elementary computer management. The programming of Calculus II starts from the assumption that the student has acquired the competences corresponding to the subjects of Calculus I and Algebra. Although there are n

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

The Industrial Engineer is the professional who uses the knowledge of the physical, mathematical and statistical sciences, together with engineering techniques, to develop his professional activity in aspects such as the control, instrumentation and automation of pr

4. Degree competences achieved in this course

Course competences	
Code	Description
CB02	Apply their knowledge to their job or vocation in a professional manner and show that they have the competences to construct and justify arguments and solve problems within their subject area.
CB03	Be able to gather and process relevant information (usually within their subject area) to give opinions, including reflections on relevant social, scientific or ethical issues.
CB04	Transmit information, ideas, problems and solutions for both specialist and non-specialist audiences.
CB05	Have developed the necessary learning abilities to carry on studying autonomously
CEB01	Ability to solve mathematical problems that may arise in engineering. Ability to apply knowledge of linear algebra; geometry, differential geometry, differential and partial differential equations, numerical methods, numerical algorithms, statistics and optimisation.
CG03	Knowledge of basic and technological subjects to facilitate learning of new methods and theories, and provide versatility to adapt to new situations.
CG04	Ability to solve problems with initiative, decision-making, creativity, critical reasoning and to communicate and transmit knowledge, skills and abilities in the field of industrial engineering.
CT02	Knowledge and application of information and communication technology.
CT03	Ability to communicate correctly in both spoken and written form.

5. Objectives or Learning Outcomes

Course learning outcomes	
Description	
Ability to express oneself correctly orally and in writing and, in particular ability to use the language of mathematics as a way of accurately expressing the quantities and operations that appear in industrial engineering. Acquired habits of working in a team and behaving respectfully.	
Proper management and knowledge of the concepts of differential geometry.	
Management of functions of one and several variables including their derivation, integration and graphic representation.	
Knowledge of the main approaches for solving by numerical methods, user level implementation of software packages for statistics, data processing, mathematical calculation and visualisation, planning algorithms and programming using a high-level programming language, visualising functions, geometric figures and data, designing experiments, analysing data and interpreting results.	
Conocer los fundamentos y aplicaciones de la Optimización.	

6. Units / Contents

Unit 1: Differential calculation on several variables.

Unit 2: Differential geometry.

Unit 3: Optimization.

Unit 4: Multiple integrals.

Unit 5: Line and surface integrals.

Unit 6: Vectorial analysis.

ADDITIONAL COMMENTS, REMARKS

NOTE.- Taking into account the relationship between its contents, the aforementioned topics can be classified into the following thematic blocks:

BLOCK I.- DIFFERENTIAL CALCULATION OF SEVERAL VARIABLES: Topics 1 and 3

BLOCK II.- INTEGRAL CALCULATION OF SEVERAL VARIABLES: Topics 4, 5 and 6.

BLOCK III.- COMPLEMENTS: Topic 2

Practices in computer classroom:

Practice 1: Introduction and Representation of graphs. Functions, Derivation and Integration of functions with several variables.

Practice 2: Basic programming with MATLAB.

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	CB02 CB03 CB04 CB05 CT03	1.2	30	N		Participatory master lesson, with blackboard and projector cannon.
Problem solving and/or case studies [ON-SITE]	Problem solving and exercises	CB02 CB03 CB04 CB05 CEB01 CG04 CT03	0.6	15	Y	N	Solving exercises and problems in the classroom.
Class Attendance (practical) [ON-SITE]	Practical or hands-on activities	CB02 CB03 CB04 CB05 CEB01 CG03 CG04 CT02 CT03	0.4	10	Y	Y	Performing problems through the use of computer programs.
Formative Assessment [ON-SITE]	Assessment tests	CB02 CB03 CB04 CB05 CEB01 CG04 CT03	0.2	5	Y	Y	Final evaluation of the subject by written test.
Study and Exam Preparation [OFF-SITE]	Self-study	CB02 CB03 CB04 CB05 CEB01 CG03 CG04 CT02	3.6	90	N		Autonomous personal study of the student and supervised work.
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
Progress Tests	20.00%	0.00%	For the evaluation of the problems carried out by the students, the approach of the problem will be assessed, the use of terminology and appropriate notation to express the ideas and mathematical relationships used, the choice of the most appropriate procedure for each situation, the justification of the different steps of the procedure used, the results obtained and the cleaning and presentation of the document.
Assessment of activities done in the computer labs	10.00%	10.00%	For the evaluation of the practices in the computer room, with application of specific software, the delivery of the work carried out in the same ones and a documentation with the resolution of the same will be valued.
Final test	70.00%	90.00%	Finally, there will be a written test that will consist of questions, theoretical questions and problems

	Total:	100.00%	100.00%	whose evaluation criteria will be similar to those of the academic works described above.
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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 order to obtain the final grade, the 4 evaluation systems described are computed, with the specified weights, and a grade equal to or greater than 4 points out of 10 must be obtained in the final written test. If the grade obtained in said test was less than 5 points, it will be considered as the final grade of the subject.

Non-continuous evaluation:

To carry out the non-continuous evaluation, the proposed activities must be delivered during the activities in the computer rooms and a final test will be carried out. If the proposed activities are not delivered, the student must obtain at least 5.6 in the final test to pass the subject.

Specifications for the resit/retake exam:

A final written test will be carried out, the weight of which will be 90% of the overall grade for the subject and will consist of questions, theoretical questions and problems where the approach to the topic or problem will be assessed, the use of appropriate terminology and notation to express ideas and relationships mathematics used, the choice of the most appropriate procedure for each situation, the justification of the different steps of the procedure used, the results obtained and the cleaning and presentation of the document. The remaining 10% of the grade corresponds to Matlab practices.

Specifications for the second resit / retake exam:

A final written test will be carried out, the weight of which will be 90% of the overall grade for the subject and will consist of questions, theoretical questions and problems where the approach to the topic or problem will be assessed, the use of appropriate terminology and notation to express ideas and relationships mathematics used, the choice of the most appropriate procedure for each situation, the justification of the different steps of the procedure used, the results obtained and the cleaning and presentation of the document. The remaining 10% of the grade corresponds to Matlab practices.

9. Assignments, course calendar and important dates	
Not related to the syllabus/contents	
Hours	hours
Class Attendance (theory) [PRESENCIAL][Combination of methods]	30
Problem solving and/or case studies [PRESENCIAL][Problem solving and exercises]	15
Class Attendance (practical) [PRESENCIAL][Practical or hands-on activities]	10
Formative Assessment [PRESENCIAL][Assessment tests]	5
Study and Exam Preparation [AUTÓNOMA][Self-study]	90
General comments about the planning: Time planning may undergo some variations depending on the calendar and the needs of the academic year. The dates of the practices will be specified in the first three school weeks.	
Global activity	
Activities	hours
Formative Assessment [PRESENCIAL][Assessment tests]	5
Study and Exam Preparation [AUTÓNOMA][Self-study]	90
Class Attendance (theory) [PRESENCIAL][Combination of methods]	30
Problem solving and/or case studies [PRESENCIAL][Problem solving and exercises]	15
Class Attendance (practical) [PRESENCIAL][Practical or hands-on activities]	10
Total horas: 150	

10. Bibliography and Sources						
Author(s)	Title/Link	Publishing house	City	ISBN	Year	Description
J.E. Mardsen, A. J. Tromba	Calculo Vectorial 6 Ed.	Addison-Wesley Iberoamericana		9788490355787	2018	
C. Pita Ruiz	Cálculo Vectorial	Prentice-Hall Hispanoamericana S. A.	México	9789688805299	1995	
P. Pedregal	Cálculo Vectorial, un enfoque práctico.	Septem Ediciones S.L.	Oviedo	9788495687067	2001	
ARANDA, E; PEDREGAL, P.	Problemas de cálculo vectorial	Lulu.com			2004	
BURGOS, J.	Cálculo infinitesimal de varias variables.	McGraw-Hill				
DEMIDOVICH, B.	5000 problemas de análisis matemático.	Ed. Paraninfo.				
GARCIA, A.; LOPEZ, A.; RODRIGUEZ, G; ROMERO, S; DE LA VILLA, A.	Cálculo II.	Ed. Clagsa			2002	
APOSTOL, T.	Calculus	Ed. Reverté			1995	
GRANERO	Cálculo infinitesimal	McGraw-Hill.				
LARSON , R; HOSTETLER, R; EDWARDS, B;	Cálculo y geometría analítica	Ed. McGraw Hill				
LOPEZ DE LA RICA, A ; DE LA VILLA, A.	Geometría diferencial.	CLAGSA.				
PERAL ALONSO, I.	Primer curso de ecuaciones en derivadas parciales	Ed. Addison-Wesley/Universidad autónoma de Madrid				
SALAS, S; HILLE, E.	Calculus	Ed. Reverté.				
STEWART, J.	Cálculo multivariable	THOMSON				
ZILL, D.	Ecuaciones diferenciales.	THOMSON				
A. García, A. López, G. Rodríguez, S. Romero, A. de la Villa	Calculo II. Teoría y problemas de funciones de varias variables	CLAGSA	Madrid	8492184701	1996	