UNIVERSIDAD DE CASTILLA - LA MANCHA

GUÍA DOCENTE

1. General information

Course: CALCULUS II
Type: BASIC
Degree: 351 - UNDERGRADUATE DEGREE PROG. IN MECHANICAL ENGINEERING (ALM)
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: 2020-21
Group(s): 55 56
Duration: C2
Second language:
English Friendly: Y
Bilingual: N

Lecturer: **CARLOS FUNEZ GUERRA** - Group(s): **55**

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Lecturer: **PEDRO JOSE MORENO GARCIA** - Group(s): **56**

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2. Pre-Requisites

The programming of this subject that includes the theoretical, practical and technical knowledge of the differential and integral calculus of a variable and linear algebra is the subject of the Calculus I and Algebra subjects of the first semester. Students who have acce

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

The Calculus II is part of the subjects that make up the Mathematics module for the degree of Engineering. These subjects are basic for the scientific and technical education of the student when promoting the development of their capacities of abstraction and scienti

The differential calculation of several variables allows the analysis of the optimization of functions and acquire quantitative techniques essential for the allocation of resources, decision-making and management in various problems that the future engineer may pose

The subject, as a whole, will allow to understand more deeply other subjects studied previously (Calculus I, Algebra, Physics, ...) and will facilitate the study of new ones, both basic and specific.

4. Degree competences achieved in this course

Course competences

Code	Description
A01	To understand and have knowledge in an area of study that moves on from the general education attained at secondary level and usually found at a level that, while supported in advanced text books, also includes some aspects that include knowledge found at the cutting edge of the field of study.
A02	To know how to apply knowledge to work or vocation in a professional manner and possess the competences that are usually demonstrated by the formulation and defence of arguments and the resolution of problems in the field of study.
A03	To have the capability to gather and interpret relevant data (normally within the area of study) to make judgements that include a reflection on themes of a social, scientific or ethical nature.
A07	Knowledge of Information Technology and Communication (ITC).
A08	Appropriate level of oral and written communication.
A12	Knowledge of basic materials and technologies that assist the learning of new methods and theories and enable versatility to adapt to new situations.
A13	Ability to take the initiative to solve problems, take decisions, creativity, critical reasoning and ability to communicate and transmit knowledge, skills and abilities in Mechanical Engineering.
A17	Ability to apply principles and methods of quality control.
B01	Ability to solve mathematical problems that occur in engineering. Aptitude to apply knowledge of: linear algebra; geometry; differential geometry; differential and integral calculus; differential and partial differential equations; numerical methods; numerical algorithms; statistics and optimization.
CB01	Prove that they have acquired and understood knowledge in a subject area that derives from general secondary education and is appropriate to a level based on advanced course books, and includes updated and cutting-edge aspects of their field of knowledge.
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

5. Objectives or Learning Outcomes

Course learning outcomes

Description
To know the tundamentals and applications of Optimization
Know the main approaches for resolution through using numerical methods, to use some statistical software packages at user level, data processing, mathematical calculus and vizualization, set out algorithms and program through programming language of a high level, vizualize functions, geometric figures and data, design experiments, analyze data and interpret results
Know the use of the functions of one and various variables including its derivation, integration and graphic representation
Be familiar with the concepts of differential geometry and use them appropriately.

Additional outcomes

6. Units / Contents

Unit 1: Differential Geometry
Unit 2: Multivariate functions: Limits and Continuity
Unit 3: Multivariate functions: Differential Calculus
Unit 4: Optimization of scalar functions
Unit 5: Multivariate functions: Multiple Integrals
Unit 6: Vector Analysis
Unit 7: Introduction to partial differential equations

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	A01 A02 A03 A07 A12 B01 CB01 CB02 CB03 CB04 CB05	1	25	N	-	
Individual tutoring sessions [ON-SITE]	Problem solving and exercises	A01 A02 A03 A08 A13 A17 B01 CB01 CB02 CB03 CB04 CB05	0.2	5	N	-	
Problem solving and/or case studies [ON-SITE]	Problem solving and exercises	A02 A07 A13 B01 CB01 CB02 CB03 CB04 CB05	0.6	15	Y	N	
Workshops or seminars [ON-SITE]	Workshops and Seminars	A02 A08 A12 A13 A17 B01 CB01 CB02 CB03 CB04 CB05	0.1	2.5	N	-	
Computer room practice [ON-SITE]	Practical or hands-on activities	A02 A07 B01 CB01 CB02 CB03 CB04 CB05	0.3	7.5	Y	N	
Final test [ON-SITE]	Assessment tests	A01 A02 A03 A07 A08 A12 A13 A17 B01 CB01 CB02 CB03 CB04 CB05	0.2	5	Y	Y	
Other off-site activity [OFF-SITE]	Self-study	A02 A03 A08 B01 CB01 CB02 CB03 CB04 CB05	3.6	90	N	-	
		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 activities done in the computer labs	5.00%	5.00%	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%	70.00%	Finally, there will be a written test that will consist of questions, theoretical questions and problems whose evaluation criteria will be similar to those of the academic works described above.
Assessment of problem solving and/or case studies	5.00%	5.00%	For the evaluation of the academic works carried out by the students in class, a memory should be given where the approach of the problem will be assessed, the use of appropriate terminology and notation to express the mathematical ideas and 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.
Progress Tests	20.00%	20.00%	Partial exams to prove the way the students are learning the subject.
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 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:

Evaluation criteria not defined

Specifications for the resit/retake exam:

There will be a final written test, whose weight will be 100% of the global grade of the subject and which will consist of questions, theoretical issues and problems where the approach of the subject or 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 cleanliness and presentation of the document.

Specifications for the second resit / retake exam:

There will be a final written test, whose weight will be 100% of the global grade of the subject and which will consist of questions, theoretical issues and problems where the approach of the subject or 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 cleanliness and presentation of the document.

9. Assignments, course calendar and important dates

Not related to the syllabus/contents	
Hours	**hours**
Individual tutoring sessions [PRESENCIAL][Problem solving and exercises]	5
Workshops or seminars [PRESENCIAL][Workshops and Seminars]	2.5
Computer room practice [PRESENCIAL][Practical or hands-on activities]	7.5
Final test [PRESENCIAL][Assessment tests]	5
Unit 1 (de 7): Differential Geometry	
Activities	**Hours**
Class Attendance (theory) [PRESENCIAL][Combination of methods]	1.5
Problem solving and/or case studies [PRESENCIAL][Problem solving and exercises]	1
Other off-site activity [AUTÓNOMA][Self-study]	4
Unit 2 (de 7): Multivariate functions: Limits and Continuity	
Activities	**Hours**
Class Attendance (theory) [PRESENCIAL][Combination of methods]	3.5
Problem solving and/or case studies [PRESENCIAL][Problem solving and exercises]	2
Other off-site activity [AUTÓNOMA][Self-study]	12
Unit 3 (de 7): Multivariate functions: Differential Calculus	
Activities	**Hours**
Class Attendance (theory) [PRESENCIAL][Combination of methods]	6.5
Problem solving and/or case studies [PRESENCIAL][Problem solving and exercises]	4
Other off-site activity [AUTÓNOMA][Self-study]	24
Unit 4 (de 7): Optimization of scalar functions	
Activities	**Hours**
Class Attendance (theory) [PRESENCIAL][Combination of methods]	3
Problem solving and/or case studies [PRESENCIAL][Problem solving and exercises]	1.5
Other off-site activity [AUTÓNOMA][Self-study]	12
Unit 5 (de 7): Multivariate functions: Multiple Integrals	
Activities	**Hours**
Class Attendance (theory) [PRESENCIAL][Combination of methods]	6
Problem solving and/or case studies [PRESENCIAL][Problem solving and exercises]	3.5
Other off-site activity [AUTÓNOMA][Self-study]	24
Unit 6 (de 7): Vector Analysis	
Activities	**Hours**
Class Attendance (theory) [PRESENCIAL][Combination of methods]	3
Problem solving and/or case studies [PRESENCIAL][Problem solving and exercises]	2
Other off-site activity [AUTÓNOMA][Self-study]	10
Unit 7 (de 7): Introduction to partial differential equations	
Activities	**Hours**
Class Attendance (theory) [PRESENCIAL][Combination of methods]	1.5
Problem solving and/or case studies [PRESENCIAL][Problem solving and exercises]	1
Other off-site activity [AUTÓNOMA][Self-study]	4
Global activity	
Activities	**hours**
Individual tutoring sessions [PRESENCIAL][Problem solving and exercises]	5
Problem solving and/or case studies [PRESENCIAL][Problem solving and exercises]	15
Workshops or seminars [PRESENCIAL][Workshops and Seminars]	2.5
Computer room practice [PRESENCIAL][Practical or hands-on activities]	7.5
Final test [PRESENCIAL][Assessment tests]	5
Other off-site activity [AUTÓNOMA][Self-study]	90
Class Attendance (theory) [PRESENCIAL][Combination of methods]	25
Total horas:	150

10. Bibliography and Sources

Author(s)	Title/Link	Publishing house	Citv	ISBN	Year	Description
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. Garcia, A. López, G. Rodríguez, S. Romero, A. de la Villa	Calculo II. Teoría y problemas de funciones de varias variables	CLAGSA	Madrid	84-921847-0-1	1996	