IDENTIFYING DATA
Mathematics: Calculus I

Subject	Mathematics: Calculus I
Code	V05G300V01105
Study programme	(*)Grao en Enxeñaría de Tecnoloxías de Telecomunicación

Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Basic education	1st	1st

Teaching language	Spanish
Department	
Coordinator	Calvo Ruibal, Natividad
Lecturers	Calvo Ruibal, Natividad Fernández Manin, Generosa González Rodríguez, Ramón Martín Méndez, Alberto Lucio
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General description	The aim that pursue with this subject is that the student know the basic technicians of the differential calculation in one and several real variables and his applications. Al term of this subject it expects that the student have achieved the understanding of the basic concepts of the differential calculation in one and several variables, the handle of the usual differential operators of the mathematical physics and of the technicians of differential calculation for the research of extremes, local approximation of functions and numerical resolution of systems of equations. Besides, it will have to know handle some computer program of symbolic calculation and graphic representation.

Competencies

Code	
B3	CG3: The knowledge of basic subjects and technologies that capacitates the student to learn new methods and technologies, as well as to give him great versatility to confront and update to new situations
B4	CG4: The ability to solve problems with initiative, to make creative decisions and to communicate and transmit knowledge and skills, understanding the ethical and professional responsibility of the Technical Telecommunication Engineer activity.
C1	CE1/FB1: The ability to solve mathematical problems in Engineering. The aptitude to apply knowledge about linear algebra, geometry, differential geometry, differential and integral calculus, differential and partial derivatives equations; numerical methods, numerical algorithms, statistics and optimization
D2	CT2 Understanding Engineering within a framework of sustainable development.
D3	CT3 Awareness of the need for long-life training and continuous quality improvement, showing a flexible, open and ethical attitude toward different opinions and situations, particularly on non-discrimination based on sex, race or religion, as well as respect for fundamental rights, accessibility, etc.

Learning outcomes

Expected results from this subject	Training and Learning Results		
Understanding of the basic concepts of the differential calculation in one and several variables.	B3 B4	C1	D2 D3
Knowledge and handle of the usual differential operators of the mathematical physics.		C1	

		B4	C1	D2
Knowledge and handle of the technicians of differential calculation for the research of extremes, the local approximation of functions and the numerical resolution of systems of equations.		B4	C1	D2
Knowledge of some computer program of symbolic calculation and graphic representation.		B3		D3

Contents

Topic	
Subject 1. Introduction.	Sets of numbers and functions of one variable. n-dimensional space. Polar, cylindrical and spherical coordinates.
Subject 2. Continuity of functions of one variable.	Limits. Continuity. Theorem of the intermediate value. Theorem of Bolzano. Method of bisection.
Subject 3. Continuity of functions of several variables.	Functions of several variables. Limits. Continuity. Theorem of Bolzano.
Subject 4. Derivation of functions of one variable.	Derivation of a function in a point. Derivative function, derivative successive, properties. Rule of the chain. Implicit derivation. Derivation of reverse functions.
Subject 5. Applications of the derivative.	Maxima and minimum. Theorem of the mean value. Rule of L'Hopital. Local study of the graphic of a function. Taylor polynomial. Method of Newton.
Subject 6. Differential of functions of several variables.	Directional derivatives. Partial derivatives. Jacobian matriz. Rule of the chain. Higher order derivatives. Differential operators.
Subject 7. Applications of the differential calculation.	Extreme values. Extreme values with equality constraints. Method of Newton.

Planning

	Class hours	Hours outside the classroom	Total hours
Master Session	38	66.5	104.5
Troubleshooting and / or exercises	10	14	24
Laboratory practises	2	1.5	3.5
Troubleshooting and / or exercises	4	8	12
Troubleshooting and / or exercises	2	4	6

*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.

Methodologies

	Description
Master Session	The professor will expose the theoretical contents of the matter. Through this methodology the competencies CG3, CE1 and CT3 are developed.
Troubleshooting and / or exercises	The professor will resolve problems and exercises of each one of the subjects and the student will have to resolve similar exercises. Through this methodology the competencies CG3, CG4, CE1, CT2 and CT3 are developed.
Laboratory practises	The students will use computer tools (Maxima and/or Matlab) to resolve exercises and apply the knowledge purchased in the theoretical classes. Through this methodology the competencies CG3, CG4, CE1, CT2 and CT3 are developed.

Personalized attention

Methodologies	Description
Master Session	The professor will attend personally the doubts and queries of the students. They will attend doubts so much of form presencial, especially in the classes of problems and in the schedules of tutorías, as of form no presencial by means of electronic post. The students will have occasion of to go to tutorías in the dispatch of the professor in the time that the professors will establish to such effect to principle of course and that will publish in the page of the subject.
Troubleshooting and / or exercises	The professor will attend personally the doubts and queries of the students. They will attend doubts so much of form presencial, especially in the classes of problems and in the schedules of tutorías, as of form no presencial by means of electronic post. The students will have occasion of to go to tutorías in the dispatch of the professor in the time that the professors will establish to such effect to principle of course and that will publish in the page of the subject.

Laboratory practises	The professor will attend personally the doubts and queries of the students. They will attend doubts so much of form presencial, especially in the classes of problems and in the schedules of tutorías, as of form no presencial by means of electronic post. The students will have occasion of to go to tutorías in the dispatch of the professor in the time that the professors will establish to such effect to principle of course and that will publish in the page of the subject.

Assessment

	Description	Qualification	Training and Learning Results	
Troubleshooting and / or exercises	First session (1 hour): Subject 1. (Aprox. week 5). Second session (1 hour): Subjects 2 and 3. (Aprox. week 8). Third session (1 hour): Subjects 4 and 5. (Aprox. week 11). Fourth session (1 hour): Subject 6. (Aprox. week 14). The four previous sessions add 40% of the total note. The punctuation of each one of them will be of 10%.	40	B3 B4	C1
Troubleshooting and / or exercises	Final examination on the subjects 1, 3, 6 and 7 of the matter. The punctuation will be 60% of the total note.	60	B4	C1

Other comments on the Evaluation

1. Continuous evaluation

It will be considered that a student has opted by the continuous evaluation when, after knowing the qualification obtained in first session, he deliver to the professor (before October 16) the sheet of registration in this type of evaluation. It will not be able to change the option of evaluation. The sessions are not recoverable, in other words, if a student cannot present himself to realize in day stipulated, the professor does not have obligation to repeat them. Before the completion or delivery of each test the date and procedure for the review of the qualifications obtained will be indicated; these qualifications will be open to the students in a reasonable period of time.

In this case, the final qualification for a student is given by the formula

N = (1/10) x C + (6/10) x E

C : qualification, between 0 and 40, obtained as the sum of the qualifications of the four sessions of an hour.

E : qualification, between 0 and 10, obtained in the final examination on the subjects 1, 3, 6 and 7 of the matter.

In this mode, it is considered that a student has successfully completed the course when N is greater than or equal to 5. Qualifications obtained in the tests will be valid only for the academic course in which they are realized.

2. Evaluation at the end of the semester

Students who do not choose continuous evaluation may be submitted to an examination, which will not necessarily be the same as the one of the continuous evaluation. The examination will be evaluated between 0 and 10 points and it is considered that a student has successfully completed the course when the qualification of the examination is greater than or equal to 5.

3. Second chance

The day of the examination of recovery, students who have chosen continuous evaluation, will be able to opt, if they wish it, for an examination where the note is obtained as

NR= (1/10) x C + (6/10) x D

C : Note, between 0 and 40, obtained as the sum of the qualifications of the sessions of an hour.

D : Note, between 0 and 10, obtained in an examination on the subjects 1, 3, 6 and 7 of the matter.

In this mode, it is considered that a student has successfully completed the course when **NR** is greater than or equal to 5.

In case of no choosing this option, or if they do not qualify to chose it because the have not participated in he continuous evaluation, the recovery examination, not necessarily the same as that taken by the students who have chosen the above mentioned option, will be also a three hour maximum tests of items 1, 2, 3, 4, 5, 6 and 7. In this case, the test will be evaluated on 10 points and it will be considered that a student has successfully completed the course when the qualification

of the examination is greater than or equal to 5.

4. Qualification of Not Present

A student will be deemed not present if he does not opt for continuous evaluation and, at most, he appears to the first test of one hour. Otherwise he shall be deemed present and he shall be granted the corresponding qualification.

5. Should cheating or use unauthorized electronic devices in any of the tests taken, the qualification will be 0 in that test. The teachers will inform the direction of the School of the incident so that the appropriate measurement will be taken.

Sources of information
J. Stewart, **Cálculo de una variable: conceptos y contextos.**, 4ª edición,
D.G. Zill y W.S. Wright, **Cálculo de una variable**, 4ª edición,
E. Marsden y A.J. Tromba, **Cálculo vectorial**, 5ª edición,

Recommendations
Subjects that continue the syllabus
Physics: Analysis of Linear Circuits/V05G300V01201
Physics: Fields and Waves/V05G300V01202
Mathematics: Calculus II/V05G300V01203
Mathematics: Probability and Statistics/V05G300V01204
Digital Signal Processing/V05G300V01304
Electromagnetic Transmission/V05G300V01303

Subjects that are recommended to be taken simultaneously
Mathematics: Linear Algebra/V05G300V01104