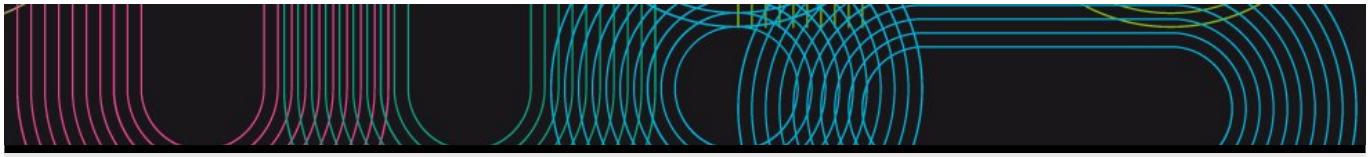

IDENTIFYING DATA

Mathematics: Calculus 2

Subject	Mathematics: Calculus 2			
Code	V05G306V01106			
Study programme	Bachelor Degree in Telecommunication Technologies Engineering (BTTE)			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Basic education	1st	2nd
Teaching language	Spanish			
Department				
Coordinator	Álvarez Vázquez, Lino José			
Lecturers	Álvarez Vázquez, Lino José Martínez Varela, Áurea María			
E-mail	lino@dma.uvigo.es			
Web	http://moovi.uvigo.gal			
General description	The matter of Calculus II of the Degree in Engineering of Technologies of Telecommunication provides basic and common training to the branch of the telecommunication. Such as it figures in the memory of the degree, students should be able to formulate, to solve and to interpret mathematically problems within engineering of telecommunication at the end of the lectures. For this, they should know how to calculate integrals of functions of one and several variables and its meaning and they should handle the basic numerical methods of approximation for this kind of integrals. On the other hand, they should become familiar with the developments of functions in Fourier series. Also, they will have to know how to solve differential equations of first and second order. Finally, they should know to handle the Laplace transform in order to solve differential equations. All of these contents are notable for several matters that they must to study simultaneously or later in the degree.			

Training and Learning Results

Code	
B3	CG3: The knowledge of basic subjects and technologies that enables the student to learn new methods and technologies, as well as to give him great versatility to confront and adapt 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 differential 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.

Expected results from this subject

Expected results from this subject	Training and Learning Results			
Managing the transformation of Laplace as a tool of analysis of the linear systems.	A5	B3 B4 B7	C1	D2 D3
Knowledge of the necessary theoretical bases for the analysis of Fourier.	A1 A2 A3 A4 A5	B1 B3 B4 B10	C1	D2 D3

Knowledge and handle of the simple techniques for the integration of ordinary differential equations.	A1 A2 A3 A4 A5	B1 B3 B4 B5 B10	C1	D2 D3
Understanding the basic theory of integration of functions of one and several variables.	A2 A3 A4 A5	B1 B3 B4 B4 B8 B10	C1	D2 D3

Contents	
Topic	
Subject 1. Integral calculus in R.	The Riemann integral: integrable functions. Fundamental theorems of the integral calculus. Computation of primitives: integration by parts and change of variable. Improper integrals.
Subject 2. Numerical methods for the approximation of integrals.	Quadrature rules of interpolating polynomial type. Properties. Interpolation error. Particular cases: Poncelet, Trapezoidal and Simpson. Composite quadrature rules.
Subject 3. Fourier series and Fourier transform.	Orthogonal functions. Fourier series. Developments of Fourier series for odd and even functions. Convergence. The Fourier transform.
Subject 4. Multiple integration.	The double and triple integrals in elementary regions. Change in the order of integration. Theorems for the change of variable. Applications.
Subject 5. The Laplace transform.	Definition of the Laplace transform. Properties.
Subject 6. Ordinary differential equations.	Generalities on the differential equations: concept of solution, families of curves and orthogonal trajectories. Differential equations of first order: existence and uniqueness of solution, exact equations, separate variables, homogeneous equations and linear equations. Differential equations of second order: existence and uniqueness of solution for linear differential equations, application of the Laplace transform, indeterminate coefficients, variation of parameters, equation of Cauchy-Euler.

Planning			
	Class hours	Hours outside the classroom	Total hours
Problem solving	21	21	42
Laboratory practical	3	0	3
Lecturing	36	60	96
Problem and/or exercise solving	3	6	9
*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.			

Methodologies	
	Description
Problem solving	In these hours of work the professor will solve problems of each one of the subjects and will enter new methods of solution no contained in the master classes from a practical point of view. The student also will have to solve problems proposed by the professor with the aim to apply the obtained knowledges. Through this methodology the competencies B3, B4, C1, D2 and D3 are developed.
Laboratory practical	In these practices, the computer tool MATLAB will be used to study and to apply the numerical methods of approximation of integrals described in the Theme 2 of the matter. Through this methodology the competencies B4, C1, D2 and D3 are developed.
Lecturing	The professor will expose in this type of classes the theoretical contents of the matter. Through this methodology the competencies B3, C1, D2 and D3 are developed.

Personalized assistance

Methodologies	Description
Lecturing	The professor will attend personally the doubts and queries of the students. He will solve doubts in his office, in the classes of problems, and in the laboratory. Also the Web platform Moovi and the email will be used to help the students. They will have occasion of to attend tutorial sessions in a timetable established at the beginning of the course and which will be published in Moovi (https://moovi.uvigo.gal/user/profile.php?id=11586).
Problem solving	The professor will attend personally the doubts and queries of the students. He will solve doubts in his office, in the classes of problems, and in the laboratory. Also the Web platform Moovi and the email will be used to help the students. They will have occasion of to attend tutorial sessions in a timetable established at the beginning of the course and which will be published in Moovi (https://moovi.uvigo.gal/user/profile.php?id=11586).
Laboratory practical	The professor will attend personally the doubts and queries of the students. He will solve doubts in his office, in the classes of problems, and in the laboratory. Also the Web platform Moovi and the email will be used to help the students. They will have occasion of to attend tutorial sessions in a timetable established at the beginning of the course and which will be published in Moovi (https://moovi.uvigo.gal/user/profile.php?id=11586).

Assessment

	Description	Qualification	Training and Learning Results		
Problem and/or exercise solving	* Three "one hour sessions": 1st session: Themes 1, 2 and 3. 2nd session: Theme 4. 3rd session: Themes 5 and 6. These three sessions account for 60% of the score with the following weights: First: 20% (2 points) Second: 20% (2 points) Third: 20% (2 points) * One final exam: 40% (4 points) Individual assessment	100	B3 B4	C1	D2 D3

Other comments on the Evaluation

The evaluation will preferably be continuous. The student will be enrolled in this kind of assessment if he attends any evaluable session. Once enrolled, it is impossible to unsubscribe from continuous assessment.

The exams of continuous evaluation are not recoverable, ie, if a student can not attend the test in the date stipulated by the teacher, it is impossible to require the repetition. Before performing each test, both the approximate date of publication of the qualifications and the date and procedure for review them will be communicated. The score obtained at the evaluable tasks will be only valid for the academic year in which the student make them.

In tests of continuous assessment the student will solve problems and exercises of the topics of matter.

The schedule of the midterm/intermediate exams will be approved in the Comisión Académica de Grado (CAG) and will be available at the beginning of each academic semester.

1. Continuous assessment.

The final score for a student who makes continuous assessment is given by the formula

N = C + E

C: Grade obtained by adding the scores of the three sessions of the items 1, 2, 3, 4, 5 and 6.
E: Grade of the final examination of the items 4, 5 and 6.

In this mode **a student will pass the subject when N is greater than or equal to 5**.

2. Global assessment.

Those students who fail to continuous assessment may be submitted to a final exam of all topics in the subject on the same date that the final exam of continuous assessment.

These students will be evaluated from 0 to 10 points and **they will pass the subject when the obtained score is greater than or equal to 5**.

3. Extraordinary exam.

Previously to the exam students who chose continuous assessment may choose, if desired, for an exam of the items 4, 5 and 6. The final grade is obtained as

NR = C + ER

C: Grade obtained by adding the scores of the three sessions of the items 1, 2, 3, 4, 5 and 6.
ER: Grade the final recovery examination of the items 4, 5 and 6.

In this mode a student **will pass the subject when NR is greater than or equal to 5**.

If they do not choose that option, the student will be assessed in all the issues on the subject.

In this other method they will be evaluated from 0 to 10 points. A student **will pass the subject when the obtained score is greater than or equal to 5**.

4. Qualification of not presented.

Finally, a student is considered not presented **if is not enrolled in the continuous assessment and does not attend any of the examinations** of the subject. Otherwise the student is considered presented.

5. End-of-program exam.

The student will be assessed in all the issues on the subject.

Sources of information

Basic Bibliography

D. Zill - W.S. Wright, **Cálculo de una variable**, 4ª, McGraw-Hill, 2011
J.E. Marsden - A.J. Tromba, **Cálculo vectorial**, 5ª, Addison-Wesley, 2004
D.G. Zill - M.R. Cullen, **Ecuaciones diferenciales**, 3ª, Thomson, 2002

Complementary Bibliography

A. Quarteroni - F. Saleri, **Cálculo científico con Matlab y Octave**, 1ª, Springer, 2006

Recommendations

Subjects that continue the syllabus

Physics: Fields and Waves/V05G301V01202

Subjects that are recommended to be taken simultaneously

Physics: Analysis of Linear Circuits/V05G301V01108
Mathematics: Probability and Statistics/V05G301V01107

Subjects that it is recommended to have taken before

Mathematics: Linear algebra/V05G301V01102
Mathematics: Calculus 1/V05G301V01101