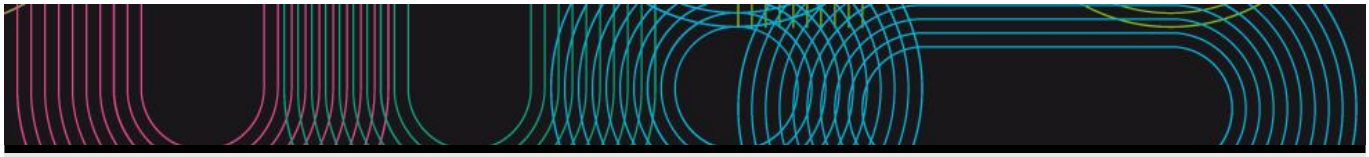

(*)Escola de Enxeñaría de Telecomunicación

(*)Páxina web

(*)

www.teleco.uvigo.es

(*)Presentación

The School of Telecommunication Engineering (EET) is a higher education school of the University of Vigo that offers Bachelor's degrees, Master's degrees and Doctoral programs in the fields of Telecommunications Engineering.

Bachelor's Degree in Telecommunication Technologies Engineering (EUR-ACE®).

The mail goal of the Bachelor's Degree in Telecommunication Technologies Engineering is to form professionals at the forefront of technological knowledge and professional competences in telecommunication engineering. This Bachelor has been recognized with the best quality seals, like the EUR-ACE's. **It has a bilingual option: up to 80% of the degree credits can be taken in English**.

http://teleco.uvigo.es/images/stories/documentos/gett/degree_telecom.pdf

www: http://teleco.uvigo.es/index.php/es/estudios/gett

Master in Telecommunication Engineering

The Master in Telecommunication Engineering is a Master's degree that qualifies to exercise the profession of Telecommunication Engineer, in virtue of the established in the Order CIN/355/2009 of 9 of February.

http://teleco.uvigo.es/images/stories/documentos/met/master_telecom_rev.pdf

www: http://teleco.uvigo.es/index.php/es/estudios/mit

Interuniversity Masters

The current academic offer includes interuniversity master's degrees that are closely related to the business sector:

Master in Cybersecurity: www: https://www.munics.es/

Master in Industrial Mathematics: www: http://m2i.es

International Master in Computer Vision: www: https://www.imcv.eu/

(*)Equipo directivo

MANAGEMENT TEAM

Directora: Rebeca Pilar Díaz Redondo (teleco.direccion@uvigo.gal)

Secretaría e Subdirección de Novas Titulacións: Pedro Rodríguez Hernández

(teleco.subdir.secretaria@uvigo.gal;teleco.subdir.novastitulacions@uvigo.gal)

Subdirección de Organización Académica: Pedro Comesaña Alfaro (teleco.subdir.academica@uvigo.gal)

Subdirección de Relaciones Internacionais e Subdirección de Infraestructuras: María Verónica Santalla del

Río (teleco.subdir.internacional@uvigo.gal; teleco.subdir.infraestructuras@uvigo.gal)

Subdirección Difusión e Captación: Laura Docio Fernández (teleco.subdir.captacion@uvigo.gal)

Subdirección de Calidade: Ana María Cao Paz(teleco.subdir.calidade@uvigo.gal)

BACHELOR□SDEGREE IN TELECOMMUNICATION TECHNOLOGIES ENGINEERING

Generalcoordinator: Lucía Costas Pérez (teleco.grao@uvigo.gal)

https://teleco.uvigo.es/es/documentos/acordos-es/comisions-academicas-es/miembros-de-la-comision-academica-del-gett/

MASTER IN TELECOMMUNICATION ENGINEERING

Generalcoordinator: Manuel García Sánchez (teleco.master@uvigo.gal)

https://teleco.uvigo.es/es/documentos/acordos-es/comisions-academicas-es/miembros-de-la-comision-academica-del-met/

MASTER INCYBERSECURITY

General coordinator:Ana Fernández Vilas (teleco.munics@uvigo.gal)

https://teleco.uvigo.es/es/documentos/acordos-es/comisions-academicas-es/miembros-de-la-comision-academica-del-munics/

MASTER ININDUSTRIAL MATHEMATICS

Generalcoordinator: Elena Vázquez Cendón (USC)

UVigo coordinator:José Durany Castrillo (durany@dma.uvigo.es)

http://www.m2i.es/?seccion=coordinacion

INTERNATIONALMASTER IN COMPUTER VISION

General coordinator: Xose Manuel Pardo López (USC)

UVigo coordinator:José Luis Alba Castro (jalba@gts.uvigo.es)

https://www.imcv.eu/legal-notice/

MASTER'S DEGREE IN QUANTUM INFORMATION SCIENCE AND TECHNOLOGIES (MQIST)

General coordinator: Javier Mas (USC)

Coordinador UVIGO: Manuel Fernández Veiga(teleco.mqist@uvigo.es)

https://quantummastergalicia.es/info

(*)Grao en Enxeñaría de Tecnoloxías de Telecomunicación

Subjects			
Year 1st			
Code	Name	Quadmester	Total Cr.
11585-53336		1st	6
11585-53337		1st	6
11585-53338		1st	6
11585-53339		1st	6
11585-53340		1st	6
11585-53341		2nd	6

11585-53342		2nd	6
11585-53343		2nd	6
11585-53344		2nd	6
11585-53345		2nd	6

IDENTIFYING DATA				
(*)Cálculo I				
Subject	(*)Cálculo I			
Code	11585-53336			
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			
E-mail	nati@uvigo.es			
Web	http://moovi.uvigo.gal			
General description	The aim of this subject is to introduce the student in the basic techniques of Differential Calculus in one and several real variables and its applications. At the end of the semester it is expected that students have achieved the understanding of the basic concepts, handle the usual differential operators of the mathematical physics and learn the techniques of differential calculus for the determination of extremes local approximation of functions and numerical solution of systems of equations. Besides, the student will learn to handle some computer programs of symbolic calculation and graphic representation.			

Training and Learning Results	
Code	
B12	To learn basic subjects and technologies that enable students to learn new methods and technologies, giving them great versatility to adapt to new situations.
C1	Solve mathematical problems that may arise in engineering. Apply knowledge of: linear algebra; geometry; differential geometry; differential and integral calculus; differential equations and partial derivatives; numerical methods; numerical algorithms; statistics and optimization.
D25	Conceiving Engineering within a framework of sustainable development.
D26	Become aware of the need for continuous quality training and improvement, demonstrating a flexible, open, and ethical attitude toward diverse opinions or situations, particularly regarding non-discrimination based on sex, race, or religion, respect for fundamental rights, accessibility, etc.
D30	Solve problems with initiative, decision-making, creativity, and the ability to communicate and transmit knowledge, skills, and abilities, understanding the ethical and professional responsibility of the Telecommunications Technical Engineer's work.

Expected results from this subject	Training and Learning Results
(*)	B12 C1 D25 D26 D30

Contents	
Topic	
Topic 1. Introduction.	Sets of numbers and functions of one variable.
Topic 2. Continuity of functions of one variable.	Limit of a function in a point. One-sided limits. Continuity. The intermediate value theorem. Bolzano's theorem. The bisection method.
Topic 3. Derivatives of functions of one variable and applications of the derivative.	Derivatives of a function at a point. Derivative function, successive derivatives, properties. Chain rule. Implicit differentiation. Derivative of inverse functions. Maxima and minima. Mean value theorem. L'Hopital's rule. Local study of the graph of a function. Taylor polynomials. Newton's method.
Topic 4. Continuity of functions of several variables.	n-dimensional space. Inner product. Norm. Vector product. Limits. Continuity. Bolzano's theorem.
Topic 5. Differential of functions of several variables.	Directional derivatives. Partial derivatives. Jacobian matrix. The chain rule. Higher order derivatives. Differential operators.
Topic 6. Applications of the differential calculation.	Extreme values. Extreme values with equality constraints. Newton's method.

Planning

	Class hours	Hours outside the classroom	Total hours
Lecturing	47	61.5	108.5
Problem solving	9	14	23
Laboratory practical	1	1	2
Problem and/or exercise solving	3	6.5	9.5
Problem and/or exercise solving	2	3.5	5.5
Laboratory practice	1	0.5	1.5

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

Methodologies

	Description
Lecturing	The teachers will expose the theoretical contents of the matter. Through this methodology competencies B12, C1 and D26 are developed.
Problem solving	The teachers will solve problems and exercises of each of the topics and the student will have to solve similar exercises. Through this methodology competencies B12, C1, D25, D26 and D30 are developed.
Laboratory practical	The students will use computer tool Matlab to solve exercises and apply the knowledge achieved in the theoretical classes. Through this methodology competencies B12, C1, D25, D26 and D30 are developed.

Personalized assistance

Methodologies	Description
Lecturing	The teachers will discuss personally the doubts and queries of the students in the schelude of personal tutorials (http://moovi.uvigo.gal) in person, whenever this is possible, and also by the distance learning method, through appointment modality, using the telematic means provided by the Universidade of Vigo.
Problem solving	The teachers will discuss personally the doubts and queries of the students in the schelude of personal tutorials (http://moovi.uvigo.gal) in person, whenever this is possible, and also by the distance learning method, through appointment modality, using the telematic means provided by the Universidade of Vigo.
Laboratory practical	The teachers will discuss personally the doubts and queries of the students in the schelude of personal tutorials (http://moovi.uvigo.gal) in person, whenever this is possible, and also by the distance learning method, through appointment modality, using the telematic means provided by the Universidade of Vigo.

Assessment

	Description	Qualification	Training and Learning Results		
Problem and/or exercise solving	Continuous evaluation consists of two partial examinations: Test 1: Topic 1, Topic 2 and Topic 3 (weight in the final qualification 25%) Test 2: Topic 4 and Topic 5 (weight in the final qualification 30%)	55	B12	C1	D30
Problem and/or exercise solving	Final exam: Topics 1, 2, 3, 4, 5 and 6.	40	B12	C1	D30
Laboratory practice	Solving exercises using a computer tool Matlab	5	B12	C1	D30

Other comments on the Evaluation

Following the guidelines of the degree program, two assessment systems will be offered: continuous assessment and global assessment.

1. Continuous Assessment

Continuous assessment consists of two tests and the laboratory practice described above, as well as the final exam. If a student cannot attend a particular test on the date for which it is scheduled, he or she miss that test.

The final grading for students in continuous assessment will be calculated using the formula:

N = max (EC + 0.4EF, EF)

EC: Grading, between 0 and 6, obtained as the sum of the marks from the two partial exams and the laboratory practice.

EF: Grading, between 0 and 10, obtained in the final exam covering all topics of the subject.

In this mode, the student has successfully completed the course when N is greater than or equal to 5.

Gradings obtained in the partial exams and the laboratory practice will only be valid for the academic year in which they are done.

2. Global assessment and End-of-program exam

Students who do not follow continuous assessment may take a final exam covering all topics of the subject. In this case, the exam will be graded between 0 and 10 points, and the student will pass when their exam grade is greater than or equal to 5.

3. Extraordinary exam

The assessment of students in the extraordinary exam will consist of a final exam covering all the content of the subject, and this exam will be graded out of 10 points. The student will pass when their exam grade is greater than or equal to 5.

4. Qualification of ''No presentado''

A student will be considered "No Presentado" if he or she did not attend either of the two final exams (the ordinary and the extraordinary exam).

5. Ethical behaviour

It is expected a correct and ethical behaviour of all students in all written tests and exams, which are meant to truly reflect the knowledge and abilities attained by each student. Any unethical behaviour detected in a particular test (such as copying or using prohibited material) will result in a grading of 0 in that test and the incident will be reported to the corresponding academic authorities for prosecution.

Sources of information

Basic Bibliography

J. Stewart, **Cálculo de una variable: conceptos y contextos.**, 4ª edición, Cengage Learning, 2011

E. Marsden y A.J. Tromba, **Cálculo vectorial**, 6ª edición, Pearson, 2018

Complementary Bibliography

Recommendations

Subjects that continue the syllabus

(*)Análisis de circuitos lineales/11585-53343
(*)Cálculo II/11585-53341
(*)Física general para telecomunicación/11585-53338
(*)Probabilidad y estadística/11585-53342
(*)Procesado de señales I/11585-53344
Physics: Fields and Waves/V05G301V01202
Electromagnetic Transmission/V05G301V01207

Subjects that are recommended to be taken simultaneously

(*)Álgebra lineal/11585-53337

IDENTIFYING DATA				
(*)Álgebra lineal				
Subject	(*)Álgebra lineal			
Code	11585-53337			
Study programme	(*)Grao en Enxeñaría de Tecnoloxías de Telecomunicación			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Basic education	1st	1st
Teaching language	#EnglishFriendly Spanish Galician			
Department				
Coordinator	González Rodríguez, Ramón			
Lecturers	González Rodríguez, Ramón Martín Méndez, Alberto Lucio			
E-mail	rgon@dma.uvigo.es			
Web	http://moovi.uvigo.gal/			
General description	The subject Linear Algebra is taught in the first four-month period of the first course of the Grado en Ingeniería de Tecnologías de Telecomunicación, with the main objective of providing students with a clear understanding of the complex numbers, systems of linear equations and elementary techniques of matrix algebra as well as an introduction to the fundamental concepts of vector vpaces which will be needed in later subjects. Special attention will be paid to the applications of Linear Algebra. This subject is part of the English Friendly Program. International students may request from the teaching staff: a) Course materials and bibliographic references in English. b) Tutoring sessions in English. c) The option to complete assessments and exams in English.			

Training and Learning Results	
Code	
B12	To learn basic subjects and technologies that enable students to learn new methods and technologies, giving them great versatility to adapt to new situations.
C1	Solve mathematical problems that may arise in engineering. Apply knowledge of: linear algebra; geometry; differential geometry; differential and integral calculus; differential equations and partial derivatives; numerical methods; numerical algorithms; statistics and optimization.
D25	Conceiving Engineering within a framework of sustainable development.
D26	Become aware of the need for continuous quality training and improvement, demonstrating a flexible, open, and ethical attitude toward diverse opinions or situations, particularly regarding non-discrimination based on sex, race, or religion, respect for fundamental rights, accessibility, etc.
D30	Solve problems with initiative, decision-making, creativity, and the ability to communicate and transmit knowledge, skills, and abilities, understanding the ethical and professional responsibility of the Telecommunications Technical Engineer's work.

Expected results from this subject	Training and Learning Results		
(*)	B12	C1	D25 D26 D30

Contents	
Topic	
Topic 1. Complex numbers.	Operations with complex numbers. Geometric concepts associated with complex numbers. Euler's formula and its consequences.
Topic 2. Matrices and determinants.	Matrix operations: addition, scalar multiplication and product of matrices. Matrix inverse. Block matrices. Determinants.
Topic 3. Systems of linear equations.	Systems of linear equations. Elementary row operations and Gauss method. Numerical methods for systems of linear equations.
Topic 4. Vector spaces and linear transformations.	Linear independence. Subspaces. Basis. Dimension. Rank of a system of vectors. Introduction to linear transformations. Matrix of a linear transformation.
Topic 5. Matrix diagonalization.	Eigenvalues and eigenvectors. Eigenspace. Matrix diagonalization and diagonalizable matrices.

Topic 6. Spaces with inner product and applications	Spaces with inner product. Orthogonality. Gram-Schmidt Method. Orthogonal and unitary Diagonalization. Singular value decomposition. Matrix rank reduction. The method of least squares. Quadratic forms.

Planning

	Class hours	Hours outside the classroom	Total hours
Laboratory practical	2	2	4
Lecturing	46	69	115
Problem solving	9	9	18
Problem and/or exercise solving	6	7	13

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

Methodologies

	Description
Laboratory practical	Solving assigned exercises and model problems. Use of the computer tool MATLAB. These practicals are not mandatory. Through this methodology the competences B12, D30, C1, D25 and D26 are developed.
Lecturing	Explanation and development by the teacher of the contents of the various topics in the syllabus. Through this methodology the competences B12, C1 and D26 are developed.
Problem solving	Resolution by part of the professor of suitable exercises adapted to each topic. The students will also have to take part in the resolution of exercises in order to strengthen their knowledge. Through this methodology the competences B12, D30, C1, D25 and D26 are developed.

Personalized assistance

Methodologies	Description
Problem solving	Personalized tutoring will be available from all the teachers of the subject. For request or consult tutorials, the student can access the corresponding link in https://moovi.uvigo.gal/login/index.php
Laboratory practical	Personalized tutoring will be available from all the teachers of the subject. For request or consult tutorials, the student can access the corresponding link in https://moovi.uvigo.gal/login/index.php
Lecturing	Personalized tutoring will be available from all the teachers of the subject. For request or consult tutorials, the student can access the corresponding link in https://moovi.uvigo.gal/login/index.php
Tests	**Description**
Problem and/or exercise solving	Personalized attention will be available for assistance in the revision of tests and exams. For request or consult tutorials, the student can access the corresponding link in https://moovi.uvigo.gal/login/index.php

Assessment

	Description	Qualification	Training and Learning Results		
Problem and/or exercise solving	The assessment plan is as follows: E1. Exam on Topics 1 and 2 (20% of the final grade). E2. Exam on Topics 3 and 4 (20% of the final grade). E3. Exam on Topics 5 and 6 (20% of the final grade). F. Final exam covering all topics in the course (35% of the final grade). P. Submission via Moovi of a Matlab assignment in which a problem will be solved (5% of the final grade) The schedule of the different intermediate assessment tests will be approved by an Academic Degree Committee (CAG) and will be available at the beginning of the semester.	100	B12	C1	D25 D26 D30

Other comments on the Evaluation

Ordinary Exam:

Continuous Assessment:

The final grade will be obtained through symmetric rounding to one decimal place:

N = Round (M, 1)

where **M** is calculated with the formula:

M = NotE1 + NotE2 + NotE3 + NotF + NotP

Here, **NotE1**, **NotE2**, and **NotE3** are the grades, between 0 and 2, obtained in exams E1, E2, and E3 respectively; **NotF** is the grade, between 0 and 3.5, obtained in the final exam F and, finally, **NotP** is the grade, between 0 and 0.5, obtained from the assignment P.

Before each test or assignment is carried out or submitted, the date and the procedure for reviewing the corrected tests will be announced. Grades will be published within a reasonable time frame. The tests are not reschedulable: if a student does not attend on the scheduled date and time, the teaching staff is not required to offer a make-up test.

Grades obtained through continuous assessment will only be valid for the academic year in which they are earned.

A student will be considered to have opted for continuous assessment if they attend the second exam, **E2**, corresponding to Topics 3 and 4.

Global Assessment:

Students who do not opt for continuous assessment may take a single exam covering Topics 1, 2, 3, 4, 5, and 6. This exam will be graded on a scale from 0 to 10 points.

Extraordinary Exam:

Students who do not pass at the end of the semester will have the option to take a second final exam on the date and time published by the School in the official exam calendar. This exam will cover Topics 1 through 6 and will be graded on a scale from 0 to 10 points.

Note: During the exam correction period, instructors may contact students by phone or online to clarify aspects of their answers. These clarifications may affect the final grade of the exam.

Not Attended (No presentado) Grade:

- In the ordinary opportunity, students who did not opt for continuous assessment and do not attend the final exam will receive a grade of "Not Attended" (No presentado).
- In the extraordinary opportunity, students who received a "Not Attended" (No presentado) in the first call and do not take the recovery exam will also receive a "Not Attended" (No presentado) grade.

End of Program exam:

Students taking the Final Year Call will sit for an exam covering all topics of the course, graded on a scale from 0 to 10 points.

Ethical Conduct:
All students are expected to demonstrate ethical behavior in all assessments, which must accurately reflect the knowledge and preparation they have acquired. If a breach of ethical conduct is detected in any specific test, the grade for that test will automatically be zero (0), and a report will be sent to the School Administration.

Sources of information
Basic Bibliography
R. González Rodríguez, **Álxebra Linear: Historia, Teoría e práctica**, 978-84-8158-9191-1, Servizo de Publicacións da Universidade de Vigo, 2021
D. C. Lay, **Álgebra lineal y sus aplicaciones**, 3ª, Pearson Educación, 2007
L. Merino; E. Santos, **Álgebra lineal con métodos elementales**, 1ª, Paraninfo, 2006
Complementary Bibliography

J. de Burgos, **Álgebra lineal y geometría cartesiana**, 2ª, McGraw-Hill/Interamericana de España, S. A. U., 2000
D. Poole, **Álgebra lineal: Una introducción moderna**, 2º, Cengage Learning Editores S.A., 2006

Recommendations

Subjects that continue the syllabus

Mathematics: Calculus 2/V05G301V01106

Subjects that are recommended to be taken simultaneously

Mathematics: Calculus 1/V05G301V01101

IDENTIFYING DATA				
(*)Física general para telecomunicación				
Subject	(*)Física general para telecomunicación			
Code	11585-53338			
Study programme	(*)Grao en Enxeñaría de Tecnoloxías de Telecomunicación			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Basic education	1st	1st
Teaching language	#EnglishFriendly Spanish			
Department				
Coordinator	Chiussi , Stefano			
Lecturers	Chiussi , Stefano Fernández Doval, Ángel Manuel			
E-mail	schiussi@uvigo.es			
Web	http://moovi.uvigo.gal			
General description	Introduction of basic concepts on Electricity, Magnetism and Geometrical Optics, and to their application to solve Engineering problems. "English Friendly" subject. International students may request from the lecturers: a) materials and bibliographic references in English, b) tutoring sessions in English, c) tests and assessments in English.			

Training and Learning Results	
Code	
B12	To learn basic subjects and technologies that enable students to learn new methods and technologies, giving them great versatility to adapt to new situations.
B13	Know the methods necessary for carrying out measurements, calculations, evaluations, appraisals, expert reports, studies, reports, task planning, and other similar work in your specific field of telecommunications.
C3	Understand and master the basic concepts of the general laws of mechanics, thermodynamics, fields and waves and electromagnetism and their application to solve engineering problems.
C49	Manage mandatory specifications, regulations and standards.
D26	Become aware of the need for continuous quality training and improvement, demonstrating a flexible, open, and ethical attitude toward diverse opinions or situations, particularly regarding non-discrimination based on sex, race, or religion, respect for fundamental rights, accessibility, etc.

Expected results from this subject	Training and Learning Results		
(*)	B12 B13	C3 C49	D26

Contents	
Topic	
Quantities and measurements	Physical quantities and units. The International System. Direct and indirect measurements. Measurement uncertainty. Propagation of uncertainty. Vector quantities. Operations with vector quantities. Introduction to scalar and vector fields.
Work and energy	Work, energy, and power. Energy conservation.
Electrostatics	Electric charge. Forces between electric charges. Coulomb's law. Electric field. Electric flux. Gauss's law. Electric potential. Electric capacitance. Capacitors. Electric field and potential in dielectrics.

Electric Current	Direct electric current. Conductivity and electric current density. Electrical resistance. Ohm's law. Voltage sources. Kirchhoff's rules. Joule effect.
Magnetism	Magnetic forces on electric charges and electric currents. Magnetic field. Sources of magnetic field. Law of Biot and Savart. Ampere's law.
Electromagnetic induction	Electromagnetic induction. Faraday's law. Self-inductance. Mutual inductance.
Geometric optics	Fermat's principle Laws of reflection and refraction. Chromatic dispersion. Spherical dioptres, lenses and mirrors. Ray and image tracing. Thin lens formulae. Optical instruments.

Planning

	Class hours	Hours outside the classroom	Total hours
Lecturing	28	34	62
Problem solving	21	40	61
Laboratory practical	9	13	22
Objective questions exam	0.5	0	0.5
Problem and/or exercise solving	3.5	0	3.5
Report of practices, practicum and external practices	1	0	1

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

Methodologies

	Description
Lecturing	Prior personal work: -Preliminary reading of the proposed bibliography on the subject. During the lectures: -Presentation of theoretical concepts. -Application of the theoretical concepts to simple cases and situations. -Experimental demonstrations. -Audiovisual presentations. Ulterior personal work: -Revision of theoretical concepts. -Solving of questions and exercises from the bibliography. -Consult the bibliography. -Identification of weak points which require tutorial aid. Through this methodology, competencies B12, C3, B13 and C49 are worked out.
Problem solving	Solving of average-difficulty problems involving one or more theoretical concepts. During the lectures: -Presentation of solving strategies and techniques by solving example-problems. Personal work: -Solving of problems from the bibliography. -Identification of weak points which require tutorial aid. Through this methodology, competencies B12, C3, B13 and C49 are worked out.

Laboratory practical	Prior personal work: -Preparation of the practical session by studying the corresponding guide and reviewing the theory. During the practical session: -Description of the experiment highlighting which theoretical concepts are involved. -Training on material and instrumentation handling. -Execution of the experiment. -Preliminary result processing. Ulterior personal work: -Processing and analysis of the results. -Weak-point identification. -Consult the bibliography. Through this methodology, competencies B12, C3, B13, C49 and D26 are worked out.

Personalized assistance

Methodologies	Description
Lecturing	Questions will be solved by the lecturers in their respective tuitional-aid time. Tutoring sessions will be held: individually or in small groups (typically of two or three students), by appointment to the corresponding lecturer (unless stated otherwise) and, preferably, in the place and timetable of the corresponding lecturer which will be published at the beginning of the semester. The appointment shall be arranged either by e-mail (see https://moovi.uvigo.gal) or in person at the beginning or end of a lecture.
Problem solving	Questions will be solved by the lecturers in their respective tuitional-aid time. Tutoring sessions will be held: individually or in small groups (typically of two or three students), by appointment to the corresponding lecturer (unless stated otherwise) and, preferably, in the place and timetable of the corresponding lecturer which will be published at the beginning of the semester. The appointment shall be arranged either by e-mail (see https://moovi.uvigo.gal) or in person at the beginning or end of a lecture.
Laboratory practical	Questions will be solved by the lecturers in their respective tuitional-aid time. Tutoring sessions will be held: individually or in small groups (typically of two or three students), by appointment to the corresponding lecturer (unless stated otherwise) and, preferably, in the place and timetable of the corresponding lecturer which will be published at the beginning of the semester. The appointment shall be arranged either by e-mail (see https://moovi.uvigo.gal) or in person at the beginning or end of a lecture.

Assessment

	Description	Qualification	Training and Learning Results		
Objective questions exam	Solving of questions related to the theoretical concepts of the topics in both the classroom and laboratory syllabi.	10	B12 B13	C3 C49	
Problem and/or exercise solving	Solving of simple exercises related to the theoretical concepts of the topics in the syllabus. Solving of problems involving one or more theoretical topics.	70	B12 B13	C3 C49	
Report of practices, practicum and external practices	Execution of real and simulated measurements. Real- and simulated-measurement result processing.	20	B12 B13	C3 C49	D26

Other comments on the Evaluation

(This is a translation, in case of any discrepancy or dispute, the original Spanish version shall prevail.)

The common assessment and grading rules of the University of Vigo are established in:

[RAUV] "Regulamento sobre a avaliación, a cualificación e a calidade da docencia e do proceso de aprendizaxe do estudantado" (available only in Galician language at https://secretaria.uvigo.gal/uv/web/normativa/public/show/565).

Each student summoned to an assessment test must appear with an original official document proving their identity (DNI, NIE, passport, university card or Spanish driving licence). [RAUV Art.28.4].

In the event that a fraudulent action is detected in the performance or revision of any of the assessment tests (copying, plagiarism, impersonation, introduction or use of means not permitted by the rules and instructions of the exercises and assessment tests, alteration, subtraction or destruction of the same, etc.) [RAUV Art.42]:

- The person(s) involved shall be identified and immediately expelled from the assessment test.

- A final grade of zero points (fail) will be assigned to the person(s) involved.

- A report will be submitted to the school management for disciplinary action to be taken.

1. ORDINARY ASSESSMENT OPPORTUNITY

1.1. INTERMEDIATE CONTINUOUS ASSESSMENT TESTS

The schedule of the intermediate assessment tests will be made available by the beginning of the semester in which this subject is taught. These intermediate tests are not recoverable, i.e., they can be only taken in the scheduled dates.

The assessment tests that the student has not taken will be graded with 0 (zero points).

The corrected exercises may be revised, by requesting a tutoring session from the corresponding lecturer, during the fourteen days following the date of publication of the marks.

There will be two intermediate continuous assessment tests:

1.1.1 FIRST CONTINUOUS ASSESSMENT EXAM (EC1+LC1)

Written exam with two parts:

EC1)

-Questions, exercises and problems (EC1 mark between 0 and 2,5 points).

-If a student does not take this part, it will be graded with 0 (zero points).

LC1)

-Laboratory problem comprising the execution of real or simulated measurements and the processing of the results (LC1 mark between 0 and 1 point).

-If a student does not take this part, it will be graded with 0 (zero points).

Duration: 75 minutes at a classroom lecture.

1.1.2 SECOND CONTINUOUS ASSESSMENT EXAM (EC2+LC2)

Written exam with two parts:

EC2)

-Questions, exercises and problems (EC2 mark between 0 and 2,5 points).

-If a student does not take this part, it will be graded with 0 (zero points).

LC2)

-Laboratory problem comprising the execution of real or simulated measurements and the processing of the results (LC2 mark between 0 and 1 point).

-If a student does not take this part, it will be graded with 0 (zero points).

Duration: 75 minutes at a classroom lecture.

1.2. FINAL EXAMINATION

Written exam with three optional parts:

E12F)

-Questions, exercises and problems corresponding to the contents of EC1 and EC2 (mark E12F between 0 and 4 points).

-If a student does not take this part, the E12F mark will be assigned the sum of the EC1 and EC2 marks.

E3F)

-Questions, exercises and problems (E3F mark between 0 and 4 points).

-If a student does not take this part, it will be graded with 0 (zero points).

LF)

-Laboratory problem comprising the execution of real or simulated measurements and the processing of the results (LF mark between 0 and 2 points).

-If a student does not take this part, the LF mark will be assigned the sum of the LC1 and LC2 marks.

Duration: 4 hours on the place and date officially assigned for the subject in the examinations schedule of the Centre.

1.3. FINAL GRADING OF THE ORDINARY ASSESSMENT OPPORTUNITY

A student who does not take any of the three parts of the final examination (§1.2) will be regarded as "not presented" to the ordinary assessment opportunity.

A combined mark CCF will be calculated as the sum of the marks of the three parts of the final examination (§1.2).

The final grade FINAL_F will be the lower of 10 points and CCF.

CCF = E12F+E3F+LF

FINAL_F = min{CCF, 10}

2. EXTRAORDINARY ASSESSMENT OPPORTUNITY

2.1. RESIT EXAMINATION

Written exam with three optional parts:

E12R)

-Questions, exercises and problems corresponding to the contents of E12F (mark E12R between 0 and 4 points).

-If a student does not take this part, the E12R mark will be assigned the E12F mark.

E3R)

-Questions, exercises and problems (E3R mark between 0 and 4 points).

-If a student does not take this part, the E3R mark will be assigned the mark obtained in E3F.

LR)

-Laboratory problem comprising the execution of real or simulated measurements and the processing of the results (LR mark between 0 and 2 points).

-If a student does not take this part, the LR mark will be assigned the LF mark.

Duration: 4 hours on the place and date officially assigned for the subject in the examinations schedule of the Centre.

2.2. FINAL GRADING OF THE EXTRAORDINARY ASSESSMENT OPPORTUNITY

A student who does not take any of the three parts of the resit examination (§2.1) will be regarded as "not presented" to the extraordinary assessment opportunity.

A combined mark CCR will be calculated as the sum of the marks of the three parts of the resit examination (§2.1).

The final grade FINAL_R will be the lower of 10 points and CCR.

CCR = E12R+E3R+LR

FINAL_R = min{CCR, 10}

3. END-OF-PROGRAM CALL

3.1. END-OF-PROGRAM EXAMINATION

Written exam with:

-Questions

-Exercises

-Problems

-Laboratory problems (with real or simulated measurements and processing of the results)

FINAL_E mark between 0 and 10 points.

Duration: 3 hours on the place and date officially assigned for the subject in the examinations schedule of the Centre.

3.2. FINAL GRADING OF THE END-OF-PROGRAM CALL

The final grade FINAL_E will be the one obtained in the end-of-program examination (§3.1).

4. CALCULATIONS AND ROUNDING:

I) All of the aforesaid calculations to obtain the marks will be performed with a resolution equal to or better than one hundredth of a point (0,01 point).

II) The final marks will be rounded to the nearest multiple of 0,1 point (one tenth of a point); if the two nearest multiples of 0,1 point are equidistant, the overall grade will be rounded to the higher of them.

III) The minimum final grade required to pass the course is 5,0 points. [RAUV Art.31]

Sources of information

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International Electrotechnical Commission (IEC)-Technical Committee 1 (Terminology), **International Electrotechnical Vocabulary (IEV)**, International Electrotechnical Commission (IEC),

Recommendations

Subjects that continue the syllabus

(*)Análisis de circuitos lineales/11585-53343

Subjects that are recommended to be taken simultaneously

(*)Álgebra lineal/11585-53337
(*)Cálculo I/11585-53336

Other comments

To adequately follow this subject, it is highly advisable to master the contents of high-school subjects on Mathematics and Physics.

(In the Spanish high-school curriculum:
Matemáticas I
Física y Química
Matemáticas II
Física)

IDENTIFYING DATA				
(*)Arquitectura de ordenadores				
Subject	(*)Arquitectura de ordenadores			
Code	11585-53339			
Study programme	(*)Grao en Enxeñaría de Tecnoloxías de Telecomunicación			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Basic education	1st	1st
Teaching language	#EnglishFriendly Spanish Galician			
Department				
Coordinator	Llamas Nistal, Martín Fernández Iglesias, Manuel José			
Lecturers	Álvarez Sabucedo, Luis Modesto Anido Rifón, Luis Eulogio Fernández Iglesias, Manuel José Llamas Nistal, Martín Mikic Fonte, Fernando Ariel Santos Gago, Juan Manuel			
E-mail	manolo@uvigo.es martin@uvigo.es			
Web	http://moovi.uvigo.es			
General description	Students of the degree in Engineering in Telecommunication Technologies interact with computers both as specialized users and as designers and developers of complex systems, where computers play a central role in their design and even as systems components. Hence, the motivation for a course in computer architectures is to provide students with a fundamental understanding of computer operations. For this, computers are studied at the conventional machine level, which abstracts away implementation details that will be discussed in electronics/microelectronics courses and serves as the foundation for the symbolic machine level, at which computers are programmed using high-level languages. Besides, this course provides an introduction to the operating machine level by discussing basic operating systems concept, and shows an example application of the symbolic machine level through the introduction of the Database Management Systems. This is an English Friendly course: International students may request from the teachers: a) materials and bibliographic references in English, b) tutoring sessions in English, c) exams and assessments in English.			

Training and Learning Results	
Code	
B12	To learn basic subjects and technologies that enable students to learn new methods and technologies, giving them great versatility to adapt to new situations.
C2	Program computers and manage operating systems, databases and computer programs with engineering applications.
D25	Conceiving Engineering within a framework of sustainable development.
D26	Become aware of the need for continuous quality training and improvement, demonstrating a flexible, open, and ethical attitude toward diverse opinions or situations, particularly regarding non-discrimination based on sex, race, or religion, respect for fundamental rights, accessibility, etc.
D30	Solve problems with initiative, decision-making, creativity, and the ability to communicate and transmit knowledge, skills, and abilities, understanding the ethical and professional responsibility of the Telecommunications Technical Engineer's work.

Expected results from this subject	Training and Learning Results		
	B12	C2	D25 D26 D30

Contents	
Topic	
1. Basic structure of a computer.	Introduction to the architecture of a computer. Architecture *ISA. Architectures Von Neumann and Harvard. Typical components: central Unit of process, arithmetical unit-logical, memories, registers, buses.

2. Representation and symbolic processing.	Representation of the elementary types of data: integers, characters, numbers in floating comma. Agreements on the order of storage in memory. Operations of processing. Introduction to the symbolic processing. Language assembler.
3. Computers RISC and CISC.	Formats and repertoire of instructions. Address modes. Assembler. Example of programs. Other types of computers.
4. Structures of data and technical of programming	Structures of data. Battery. Subroutines. Steps of parameters. Technicians of programming and purification of programs.
5. Management of the Periphery	Types of peripherals. Treatment of the variety. Models. Secondary memories. Interruptions. Routines of service. *ADM: Justification.
6. Memories	Types of memories and memories hierarchy. Memory management: virtual memory, paging and segmentation.
7. Parallel architectures	Chaining (pipelining). Parallelism in the accesses to memory. Associative Memory. Parallel architectures. Vectorial processors. Multiprocessors.
8. Operating systems	Introduction to the Operating systems. Types and functions. Folders and management of files. Management of processes: creation programming and synchronisation.

Planning

	Class hours	Hours outside the classroom	Total hours
Laboratory practical	22	27.5	49.5
Introductory activities	5	5	10
Problem solving	15	22.5	37.5
Lecturing	14	28	42
Self-assessment	0	3	3
Laboratory practice	2	48	50
Laboratory practice	2	4	6
Problem and/or exercise solving	1	4	5
Problem and/or exercise solving	2	5	7

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

Methodologies

	Description
Laboratory practical	The course includes programming assignments that will performed using an ARM simulator. Using this methodology, competences B12, C2, D25, D26 and D30. are developed.
Introductory activities	Presentation of course contents, methodology, tutoring hours, evaluation, lab work, and any other issue related to the subject. Through this methodology, competences B12 snd D25 are developed.
Problem solving	Programming, information representation, and other problems and exercises will be solved at lecture time. Some will be solved by students in advance at home, and they will participate actively in the solution of additional problems. Through this methodology, competencies C2, D26 and D30 are developed.
Lecturing	Theoretical concepts and their practical application will be introduced during the classes. Students will be encouraged to participate by alternating lectures with problem and exercise solving. Therefore, sessions will include lectures and time for exercises and problems. Through this methodology the competencies C2, D26 and D30 are developed.

Personalized assistance

Methodologies	Description
Lecturing	Students will have the chance to attend tutorial sessions at the teacher´s office. Teachers will define an schedule for this purpose at the beginning of the course. This schedule will be published on the course website.
Laboratory practical	Students will have the chance to attend tutorial sessions at the teacher´s office. Teachers will define an schedule for this purpose at the beginning of the course. This schedule will be published on the course website.
Problem solving	Students will have the chance to attend tutorial sessions at the teacher´s office. Teachers will define an schedule for this purpose at the beginning of the course. This schedule will be published on the course website.

Assessment

	Description	Qualification	Training and Learning Results

Self-assessment	Exam questions will be available for students, in order to perform self assessment.	0	B12	C2	D25 D26 D30
Laboratory practice	EP1 continuous evaluation exam consisting of practical exercises at the laboratory on the part P1 of the lab syllabus.	16		C2	D30
Laboratory practice	EP2 continuous evaluation exam consisting of practical exercises at the laboratory on the part P2 of the lab syllabus.	24		C2	D30
Problem and/or exercise solving	ET1 continuous evaluation classroom exam consisting on questions and/or exercises, covering the part T1 of the classroom syllabus.	24	B12	C2	D25 D26 D30
Problem and/or exercise solving	ET2 continuous evaluation classroom exam consisting on questions and/or exercises, covering the part T2 of the classroom syllabus.	36	B12	C2	D25 D26 D30

Other comments on the Evaluation

ASSESSMENT

This subject is organized in two parts: Theory and Lab.

The final grade for the course (FG) is computed as the weighted average (WA) of the theory grade (TG) and Lab Grade (PG): FG = WA = 0.6 x TG + 0.4 x LG

However, if any of TG or LG is less than 3.5 and WA is greater than 4.0, then the final grade will be 4.0 or the weighted average WA of both grades, whatever is the lowest value.

To pass the course, FG must be greater than or equal than 5.0

Both parts can be evaluated by Continuous Assessment (CA) or by a Global assessment (GA), in the latter case by means of a final exam (FE).

The FE will have two parts, Theory and Lab, and will take place at the officially approved date and time.

CA will be based on the tests defined in this guide. In the case an student misses a CA test it cannot be retaken or rescheduled.

CA test grades are only valid for the current academic year, being discarded in case the student fails the course.

CLASSROOM SESSIONS / THEORY

The Theory part is divided into two sub-parts: T1 and T2. T1 corresponds to approximately half of the syllabus, while T2 covers all the syllabus.

CLASSROOM. REGULAR CALL (CONVOCATORIA ORDINARIA) ASSESSMENT

CLASSROOM. REGULAR CALL. CONTINUOUS ASSESSMENT (CA).

In the case of CA, it consists of two exams: ET1 and ET2 that correspond to the two parts in which classroom content is divided. ET1 & ET2 exam dates will be approved at a Degree□s Academic Committee (CAG) meeting and will be available at the beginning of the academic term.

Additionally, during the classroom lectures, short exercises may be proposed to be completed using your cell phone. Altogether, they can add up to one additional point to the theory grade of each part and/or extra time to CA exams.

Thus, the grade for each part will be the one obtained in the exam (0-10 points) plus the one obtained by solving the short exercises (0-1 points).

The theory CA grade for the Regular call is TG=0.4xT1 + 0.6xT2 (i.e., the weights of T1 & T2 in the final grade are respectively 40% & 60%).

CLASSROOM. REGULAR CALL. GLOBAL ASSESSMENT

All students that have not attended CA will have to attend the Final classroom exam (FCE). The FCE consists of two exercises for T1 and T2.

The global assessment's theory grade is computed as: TG=0.4xT1 + 0.6xT2

CLASSROOM. SUPPLEMENTARY CALL (CONVOCATORIA EXTRAORDINARIA) ASSESSMENT

The Supplementary call exam has the same structure as the Regular call one.

Not attending the Supplementary Call implies accepting the grade obtained at the Regular call.

If you failed the theory part (both in CA and GA), you can:

- sit both parts (ET1 and ET2), which would supersede the theory grade obtained in CA or GA.

- sit only one of the two parts (ET1 or ET2), which would supersede the grade obtained for that part in CA or GA.

- not to take any part and keep the theory grade obtained in CE or GA.

In case of CA, the grade obtained by solving the short exercises during the classroom lectures will be kept and added to the final grade.

The theory grade will be the one computed as 0.4xT1 + 0.6xT2, with the new grades from ET1 and/or ET2, if applicable. Sitting any part (ET1 and/or ET2) implies renouncing to the previously obtained grade.

CLASSROOM. END-OF-STUDIES CALL

It will consist of an exam similar to the Final exam of the Regular call.

LAB ASSESSMENT

The lab part is mandatory for all the students, and is carried out on an ARM/Thumb assembler. It is divided into two parts: P1 deals with about half of the syllabus and P2 the whole syllabus.

LAB. REGULAR CALL

LAB. REGULAR CALL. CONTINUOUS ASSESSMENT (CA)

The Lab's CA consists of 2 exercises EP1, EP2 that correspond to the two parts in which lab activities are divided. The EP1 exam□s date will be approved in a Degree□s Academic Committee (CAG), will take place in the afternoon and all the details will be available at the beginning of the academic term. EP2 will take place on the day of the Regular call□s GA. There will be a separate exam for those who opt for CA and for those who decide to sit the GA only.

Additionally, during the lab sessions, short exercises may be proposed to be completed using your cell phone. Altogether, they can add up to one additional point to the lab grade and/or extra time to CA exams..

Thus, the grade for each part will be the one obtained in the exam (0-10 points) plus the one obtained by solving the short exercises (0-1 points).

The lab CA grade for the Regular call is TG=0.4xT1 + 0.6xT2

LAB. REGULAR CALL. GLOBAL ASSESSMENT

All students opting for GA will have to attend a final lab exam (FLE).

The FLE will consist of an exercise on the complete ARM/Thumb syllabus to be performed in the lab.

The lab grade in this case is the grade obtained in the FLE.

LAB. SUPPLEMENTARY CALL EXAM

The Supplementary call's exam will be similar to the GA's FLE of the Regular call. All students who did not pass the lab part, independently of them of opting for CA or not, may attend this exam. Not attending the Supplementary call's assessment implies accepting the grade obtained at the Regular call. Nevertheless, CA students will keep the average grade obtained (0-1) from the short lab exercises.

LAB. END-OF-STUDIES CALL

It will consist of an exam similar to the FLE of the Regular call.

GENERAL REMARKS

All exercises and exams in this course are graded from 0 to 10. **As a consequence of short exercises, the student's grade may be higher than 10. In that case, the final grade would be 10, considering the total grade higher than 10 for the awarding of honours.**

Not participating in the Supplementary call assessment process implies accepting the grade obtained at the Regular call assessment.

Under no circumstances will support be given for the installation of any material on students' personal computers.

TUTORING

Tutoring sessions will be suspended t**wo school days prior** to any official exam.

CONTINUOUS ASSESSMENT ELIGIBILITY

Students may opt for CA independently for the classroom/theory part and lab/practical part. To be eligible for CA, students must take the first exam in that part (theory/ET1 and/or lab/EP1).

Once being enrolled in CA for theory or lab, students cannot opt for GA for the corresponding part. As pointed out above, students may opt to be assessed differently (CA or GA) for theory and lab.

OFFICIAL TRANSCRIPTS

If a student is graded at least once after taking any of the exams in CA or GA, its final grade will be computed according to this guide.

EXAMS

To take any classroom exam (ET1, ET2, FE) or lab exam (EP1, EP2, FLE), all students must register using the designated software tool. The registration process will be open and notified with a minimum of 5 calendar days prior to the corresponding exam.

GRADING INFO

The date and procedure for grade review will be published in advance.

COMMUNICATION WITH STUDENTS

Communication between students and lecturers will be done by means of the standard procedures established by the University. **It is assumed that all students read their email (the one registered in Moovi) at least once a day.**

ETHICAL CODE

Plagiarism is regarded as serious dishonest behavior. If any form of plagiarism is detected in any of the tests or exams, the final grade will be FAIL (0), and the incident will be reported to the corresponding academic authorities for prosecution. All students are expected to have an ethical behavior in all exams, ensuring equal opportunities for all students. If an infraction is detected in an exam, the score obtained in that test will automatically be zero (0) and a report will be issued to the School Direction to take actions.

These are some examples of unethical behavior: use of electronic devices (mobile phones, tablets, computers, etc.), copy from another peer, use of unauthorized material in an exam, etc.

Sources of information

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David A. Patterson, John L. Hennessy, **Computer Organization and Design ARM Edition: The Hardware Software Interface (The Morgan Kaufmann Series in Computer Architecture and Design)**, 978-0128017333, Morgan Kaufmann, 2016

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Manuel J. Fernández, Martin Llamas, Luis E. Anido, Juan M. santos y Fernando A. Mikic, **Manual de Programación en Ensamblador. Unha achega teórico-práctica**, 9788481589085, Universidade de Vigo. Servizo de Publicacións, 2021

Recommendations

IDENTIFYING DATA				
(*)Fundamentos de empresa				
Subject	(*)Fundamentos de empresa			
Code	11585-53340			
Study programme	(*)Grao en Enxeñaría de Tecnoloxías de Telecomunicación			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Basic education	1st	1st
Teaching language	#EnglishFriendly Spanish			
Department				
Coordinator	González Vázquez, Beatriz			
Lecturers	González Vázquez, Beatriz Urgal González, Begoña			
E-mail	bgonza@uvigo.es			
Web	http://moovi.uvigo.gal/			
General description	The objective of this subject is to make known the organisation, management and institutional framework of the company. English Friendly subject: International students may request from the teachers: a) materials and bibliographic references in English, b) tutoring sessions in English, c) exams and assessments in English.			

Training and Learning Results	
Code	
B2	Adequate knowledge of the concept of the company, institutional and legal framework of the company. Business organization and management.
C50	Know and apply basic elements of economics and human resources management, project organization and planning, as well as legislation, regulation and standardization in telecommunications
C52	Manage software tools that support problem solving in engineering.
D27	Promote cooperative work, communication skills, organization, planning, and acceptance of responsibilities in a multilingual and multidisciplinary work environment that fosters education for equality, peace, and respect for fundamental rights.
D30	Solve problems with initiative, decision-making, creativity, and the ability to communicate and transmit knowledge, skills, and abilities, understanding the ethical and professional responsibility of the Telecommunications Technical Engineer's work.

Expected results from this subject	Training and Learning Results		
	B2	C50	D27
		C52	D30

Contents	
Topic	
UNIT 1: INTRODUCTION TO BUSINESS ADMINISTRATION	1.1. The concept of firm. 1.2. Main objectives of a business firm. 1.3. Business ownership and types of companies. 1.4. The company as a system. 1.5. Business environment. 1.6. Information and communication technologies.
UNIT 2: ECONOMIC AND FINANCIAL STRUCTURE OF THE COMPANY	2.1. Economic anf Financial Structure of the company 2.2. Working capital analysis 2.3. Operating cycle and cash conversion cycle
Unit 3: THE RESULTS OF THE COMPANY AND THE BUSINESS STRATEGY	3.1. The results of the company 3.2. Profitability and competitive strategy 3.3. Solvency and liquidity
UNIT 4: THE INVESTMENT AND FINANCING IN THE COMPANY	4.1. Classes of investments 4.2. Criteria for the evaluation and selection of investments: static and dynamic 4.3. Funding Sources
UNIT 5: OPERATION MANAGEMENT (PART I). GENERAL FEATURES	5.1. Functions of Operations Management. 5.2. Classification of productive processes. 5.3. The productivity: indicators of productivity. 5.4. Innovation concept and typology.

UNIT 6: OPERATION MANAGEMENT (PART II).	6.1. The costs of production. 6.2. Break-even point. 6.3. Make-or-Buy decisions. 6.4. Operational leverage.
UNIT 7: PROJECT MANAGEMENT	7.1. Project definition and objectives. 7.2. Project scheduling techniques. 7.3. Gantt chart. 7.4. PERT network analysis.
UNIT 8: MARKETING MANAGEMENT	8.1. The market. 8.2. The competition. 8.3. Marketing system. 8.4. Marketing-mix.
UNIT 9: MANAGEMENT AND ORGANIZATION	9.1. The management system. 9.2. Human Resources management.
PRACTICAL CLASSES	The practices of the subject will adjust to the contents taught in the Theory classes

Planning

	Class hours	Hours outside the classroom	Total hours
Introductory activities	1	0	1
Lecturing	30	41	71
Practices through ICT	24	36	60
Problem solving	4	9	13
Objective questions exam	4	0	4
Essay questions exam	1	0	1

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

Methodologies

	Description
Introductory activities	On the first day of class the teaching team will try to know the students' level of the basic concepts of this subject.
Lecturing	Presentation by the professor of the contents on the subject of study, theoretical bases and / or guidelines of a work, exercise or project to be developed by the student. With this methodology, the D30 Competence; Skill C50; and Knowledge B2 are worked on.
Practices through ICT	It is a kind of classes in which the students will work individually or in pairs the practical contents of the subject. Knowledge application activities will be carried out in specific situations. In this methodology, the Skills C50, c52: and competences D27, D30 are worked on.
Problem solving	Activities in which they formulate problems and/or exercises related with the matter. The student/to has to develop the more appropriate or correct solutions. In this methodology they work on Skills C50, C52 in a practical way; competence D30 and knowledge B2.

Personalized assistance

Methodologies	Description
Lecturing	In the master sessions, the professor will attend, guide and solve the doubts of the students about the contents addressed in the theoretical classes. Students will have the right to personalized tutorials, in the schedule established for this purpose in the teleteaching platform: http://moovi.uvigo.gal/. These tutorials are intended to solve doubts and guide students on the development of the contents addressed both in the theoretical classes as well as in the practical classes. Likewise, constant communication will also be maintained between professors and students through the educational platform.
Practices through ICT	In the practical sessions the professor will pose diverse activities to the students. The students will resolve said activities, and will be able to pose to the professor the questions or questions that consider on the contents of the exercises or problems posed.
Introductory activities	In the first theory session, the teaching team will try to know individually the level that the students have on the most basic issues of this subject.

Assessment

	Description	Qualification	Training and Learning Results
Objective questions exam	The content of the theory and practical classes will be evaluated. (40% the first test and 20% the practices)	60	

Essay questions exam	Test of all the contents of the subject developed in theory and practical classes.	40

Other comments on the Evaluation

Following the guidelines established in the degree, two evaluation systems will be offered in the **ordinary exam**: continuous assessment and exam-only assessment at the end of the semester. In any of the two evaluation systems, and all the Training and Learning Results, Knowledge and Skills of the subject are evaluated.

1. Continuous assessment

The qualification by the continuous evaluation system will be determined from the following tests and activities:

- Two tests. They will be carried out during the teaching period in theory classes. Each of them will constitute 40% of the final grade for the subject. The first test does not have a liberating nature, that is, each of them will deal with the contents seen up to the moment of taking the test, both in theory and practical classes.

- Practices. The tasks assigned during the practices will account for 20% of the final grade for the subject.

The dates to take the tests will be planned by the Academic Committee of Degree and will be available at the beginning of the semester. These tests are not recoverable, that is, if a student does not perform them on the stipulated day, the professor does not have the duty to repeat them (unless there is a cause of force majeure). A student will be considered to have opted for continuous assessment when participating in the second test.

Students who opt for continuous evaluation and do not pass the subject will not be able to take the final global evaluation exam in the ordinary call.

2. Global assessment

For those students who do not opt for continuous assessment, they will be offered an evaluation procedure that allows them to obtain the highest grade. This procedure will consist in a final exam that includes the contents developed in the classes of theory and practical classes.

3. About the extraordinary exam

For the extraordinary exam, all students will be evaluated by the global evaluation system.

4. Qualification Of Absent

A student will be considered absent if, at most, took part in the first assessment test of continuous evaluation method. In any another case, the students will be considered as submitted to the assessment and they will receive their corresponding grade.

5. About the end-of-program exam

It will consist of an exam that includes the theoretical and practical contents of the subject.

Plagiarism is regarded as serious dishonest behavior. If any form of plagiarism is detected in any of the tests or exams, the final grade will be FAIL (0), and the incident will be reported to the corresponding academic authorities for prosecution.

Sources of information

Basic Bibliography

Pérez Gorostegui, E., **Curso de introducción a la economía de la empresa**, EDITORIAL UNIVERSITARIA RAMON ARECES, 2009

Diez-Viel, I., Martin de Castro, G., Montoro Sanchez, M.A., **Introduction to Business Administration**, S.L. CIVITAS EDICIONES, 2012

Complementary Bibliography

Barroso Castro, C. (Coord.), **Economía de la empresa**, Pirámide, 2012

García Márquez, F., **Dirección y Gestión Empresarial**, McGraw-Hill, 2013

Moyano Fuentes, J.; Bruque Cámara, S.; Maqueira Marín, J.M.; Fidalgo Bautista, F.A.; Martínez Jurado, **Administración de empresas: un enfoque teórico-práctico**, Grupo Anaya, 2011

Iborra Juan, M.; Dasi Coscollar, A.; Dolz Dolz, C.; Ferrer Ortega, C.., **Fundamentos de dirección de empresas. Conceptos y habilidades directivas**, Paraninfo, 2014

Recommendations

IDENTIFYING DATA				
(*)Cálculo II				
Subject	(*)Cálculo II			
Code	11585-53341			
Study programme	(*)Grao en Enxeñaría de Tecnoloxías de Telecomunicación			
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 will have to know how to solve differential equations of first and second order. Finally, they should know to handle the numerical methods 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	
B12	To learn basic subjects and technologies that enable students to learn new methods and technologies, giving them great versatility to adapt to new situations.
C1	Solve mathematical problems that may arise in engineering. Apply knowledge of: linear algebra; geometry; differential geometry; differential and integral calculus; differential equations and partial derivatives; numerical methods; numerical algorithms; statistics and optimization.
D25	Conceiving Engineering within a framework of sustainable development.
D26	Become aware of the need for continuous quality training and improvement, demonstrating a flexible, open, and ethical attitude toward diverse opinions or situations, particularly regarding non-discrimination based on sex, race, or religion, respect for fundamental rights, accessibility, etc.
D30	Solve problems with initiative, decision-making, creativity, and the ability to communicate and transmit knowledge, skills, and abilities, understanding the ethical and professional responsibility of the Telecommunications Technical Engineer's work.

Expected results from this subject	Training and Learning Results
	B12 C1 D25 D26 D30

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 rules. Adaptative quadrature rules.
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 4. Ordinary differential equations.	Generalities about differential equations: concept of solution, families of curves and orthogonal paths. Differential equations of first order: existence and uniqueness of solution, exact equations, separate variables, homogeneous and linear equations. Differential equations of second order: existence and uniqueness of solution for linear differential equations, indeterminate coefficients, variation of parameters, equation of Cauchy-Euler.
Subject 5. Numerical methods for the approximation of ordinary differential equations.	Methods for initial value problems. General concepts about the methods. One step methods. Multistep methods. Predictor-corrector methods.

Planning

	Class hours	Hours outside the classroom	Total hours
Lecturing	36	60	96
Problem solving	18	24	42
Laboratory practical	6	0	6
Problem and/or exercise solving	3	3	6

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

Methodologies

	Description
Lecturing	The teaching staff will expose in this hours of work the theoretical contents of the subject. Through this methodology the results of learning B12, C1, D25, D26 and D30 are developed. These hours are not mandatory.
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 results of learning B12, C1, D25, D26 and D30 are developed. These hours are not mandatory.
Laboratory practical	In these practices, the computer tool MATLAB will be used to study and to apply the numerical methods of approximation of integrals and differential equations. Through this methodology the results of learning B12, C1, D25, D26 and D30 are developed. These hours are not mandatory.

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	* Two sessions of an hour and a half: 1st session: Subjects 1, 2 and 3 2nd session: Subjects 4 and 5 The two sessions sum a 60% of the note having each one the following weight: First: 30% (3 points) Second: 30% (3 points) * A final examination: 40% (4 points) Individual evaluation	100	B12	C1	D25 D26 D30

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 two sessions of the items 1, 2, 3, 4 and 5.
E: Grade of the final examination of the items 3, 4 and 5.

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 3, 4 and 5. The final grade is obtained as

NR = C + ER

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

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**, 9786071505019, 4ª, McGraw-Hill, 2011

J.E. Marsden - A.J. Tromba, **Cálculo vectorial**, 9788478290697, 5ª, Addison-Wesley, 2004

D.G. Zill - M.R. Cullen, **Ecuaciones diferenciales**, 9789708300384, 3ª, Thomson, 2002

Complementary Bibliography

A. Quarteroni - F. Saleri, **Cálculo científico con Matlab y Octave**, 9788847005037, 1ª, Springer, 2006

Recommendations

Subjects that are recommended to be taken simultaneously

(*)Análisis de circuitos lineales/11585-53343
(*)Probabilidad y estadística/11585-53342

Subjects that it is recommended to have taken before

(*)Álgebra lineal/11585-53337
(*)Cálculo I/11585-53336

IDENTIFYING DATA				
(*)Probabilidad y estadística				
Subject	(*)Probabilidad y estadística			
Code	11585-53342			
Study programme	(*)Grao en Enxeñaría de Tecnoloxías de Telecomunicación			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Basic education	1st	2nd
Teaching language	Spanish			
Department				
Coordinator	Fernández Bernárdez, José Ramón			
Lecturers	Fernández Bernárdez, José Ramón Mojón Ojea, Artemio			
E-mail	jramon.fernandez@uvigo.es			
Web	http://moovi.uvigo.gal/			
General description	The aim of this subject is to study some basic concepts of statistics, probability and random processes. These concepts are necessary in order to easily follow other subsequent subjects.			

Training and Learning Results	
Code	
B12	To learn basic subjects and technologies that enable students to learn new methods and technologies, giving them great versatility to adapt to new situations.
C1	Solve mathematical problems that may arise in engineering. Apply knowledge of: linear algebra; geometry; differential geometry; differential and integral calculus; differential equations and partial derivatives; numerical methods; numerical algorithms; statistics and optimization.
D25	Conceiving Engineering within a framework of sustainable development.
D26	Become aware of the need for continuous quality training and improvement, demonstrating a flexible, open, and ethical attitude toward diverse opinions or situations, particularly regarding non-discrimination based on sex, race, or religion, respect for fundamental rights, accessibility, etc.
D30	Solve problems with initiative, decision-making, creativity, and the ability to communicate and transmit knowledge, skills, and abilities, understanding the ethical and professional responsibility of the Telecommunications Technical Engineer's work.

Expected results from this subject	Training and Learning Results
	B12 C1 D25 D26 D30

Contents	
Topic	
Probability theory	Concept of probability. Axiomatic definition. Conditional probability, total probability and Bayes theorems. Independence.
One-dimensional random variables	Concept of random variable (RV). Classification. Cumulative distribution function (CDF) and properties. Discrete random variables: probability mass function. Continuous random variables: density function. Functions of an RV. CDF and discrete RV. Transformation of continuous RVs: fundamental theorem. Mean and variance.
Random vectors	CFD and continuous RV. Marginals. Point and line masses. Conditional density. Continuous versions of Bayes and total probability theorems. Functions of two-dimensional RVs: fundamental theorem. Changes of dimension. Correlation and regression.

Estimation and limit theorems	Sample and population. Estimators. Estimation of mean and variance. Sequences of RVs. Laws of large numbers. Central limit theorem.
Stochastic processes	Description of a stochastic process. Statistics of a stochastic process. Stationarity. Examples.

Planning			
	Class hours	Hours outside the classroom	Total hours
Lecturing	28	14	42
Problem solving	16	34	50
Practices through ICT	14	7	21
Problem and/or exercise solving	2	12	14
Objective questions exam	1	6	7
Essay questions exam	2	14	16
*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.			

Methodologies	
	Description
Lecturing	The course is divided in five main topics. Each topic will have a theoretical part that will be exposed by the teacher. Students will be required to perform a previous reading of the contents. Through this methodology the competencies B12, C1 and D26 are developed.
Problem solving	Each topic will be complemented with problem resolution. The problems could be developed and solved in big or small group classes. The students will be required to work previously on these problems. Through this methodology the competencies B12, C1, D25, D26 and D30 are developed.
Practices through ICT	Each topic will be completed with one or several sessions of computer practices. For this, a software developed by the teachers (based on Python) and specific questionnaires for each topic will be used. Students will be required to perform a previous reading of the contents. Through this methodology the competencies B12, C1, D25, D26 and D30 are developed.

Personalized assistance	
Methodologies	**Description**
Lecturing	Students will have the opportunity to attend one-on-one tutorials, in person or online. Each teacher, at the beginning of the term, will establish the schedule and characteristics of the offered tutorials. The contact details of the teaching staff are specified on the subject's page, on MooVi (https://moovi.uvigo.gal), within the "Teaching staff and tutorials" section.
Problem solving	Students will have the opportunity to attend one-on-one tutorials, in person or online. Each teacher, at the beginning of the term, will establish the schedule and characteristics of the offered tutorials. The contact details of the teaching staff are specified on the subject's page, on MooVi (https://moovi.uvigo.gal), within the "Teaching staff and tutorials" section.
Practices through ICT	Students will have the opportunity to attend one-on-one tutorials, in person or online. Each teacher, at the beginning of the term, will establish the schedule and characteristics of the offered tutorials. The contact details of the teaching staff are specified on the subject's page, on MooVi (https://moovi.uvigo.gal), within the "Teaching staff and tutorials" section.

Assessment					
	Description	Qualification	Training and Learning Results		
Problem and/or exercise solving	Students must solve a problem individually	40	B12	C1	D30
Objective questions exam	Students must answer a multiple choice test individually	20	B12	C1	D30
Essay questions exam	Individual final exam	40	B12	C1	D30

Other comments on the Evaluation

Following the guidelines of the degree, two assessment systems will be offered to the students: Continuous assessment or

Global assessment.

Each student can decide himself to follow or not Continuous assessment. It is assumed that a student follows this assessment system if he sits task 2 (around the seventh week of the term) or any later task. Sitting Task 1 (both, part 1 and part 2) does not bind the student to Continuous assessment. Even so, on the day of the final exam, the student will be able to choose Global assessment. Although it is always recommended, attendance at practical classes is not mandatory to qualify for continuous assessment.

Students who choose Continuous assessment:

The assessment will comprise a range of evaluable tasks.The final grade will be determined as a weighted average, with the weights specified below, of the grades obtained in the various tasks and the final exam.

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

A brief description of the tasks and their weight in the final grade is listed below:

- Task 1: Weight 20%. Two parts, both with the same weight:
    - Part 1: Individual resolution of a problem
    - Part 2: Correction of a solution of the same problem solved by someone else
- Task 2: Individual resolution of a multiple choice test. Weight 20%
- Task 3: Individual resolution of a problem. Weight 20%
- Last Task: Final exam. A reduced version of the exam to be carried out by the students who choose Global assessment. Weight 40%

Before the completion or delivery of each task, the date and procedure for its review will be indicated. Students will have the option to know the grade of each task and review its correction within a reasonable period of time (around one week).

These tasks are not recoverable, that is, if a student cannot sit them, teachers will not be committed to repeat them, unless in the case of documented justified reasons.

Throughout the course, during class sessions, the teaching staff will propose a number of exercises. Students participating in continuous assessment who complete these exercises may receive a bonus of up to 0.5 points. This bonus will be added to the final grade obtained through the continuous assessment method, provided that the student achieves at least 30% of the maximum score in the final exam. If this threshold is not reached, no bonus will be applied. In cases where the resulting grade exceeds the maximum possible score, it will be capped at 10.

The obtained grades will be valid only for the current academic course.

If a student is binded to Continuous assessment and does not pass the course he/she will receive a grade of fail, regardless of he/she sits the final exam or not.

Students who choose Global assessment or End-of-program exam:

In these cases students will just carry out a single final exam. This exam will be graded between 0 and 10, and this value will be the final grade of the student.

Extraordinary exam:

The extraordinary exam is only available for students who have not passed the subject previously and they have to choose between Continuous and Global assessment, regardless of the system they chose at the Ordinary exam. The choice has to be made when handing in the exam to the teacher. On the other hand, grades will be obtained using the corresponding assessment system as it has been described above.

The subject is considered passed if the final grade obtained is greater than or equal to 5.

Plagiarism is regarded as serious dishonest behavior. If any form of plagiarism is detected in any of the tests or exams, the final grade will be FAIL (0), and the incident will be reported to the corresponding academic authorities for prosecution.

Sources of information

Basic Bibliography

JR Fernández, I. Alonso y A. Mojón, **Apuntes de Probabilidad y Estadística**, 15 ed, 2026

JR Fernández, I. Alonso and A. Mojón, **Notes on Probability and Statistics**, 5 ed, 2026
A Mojón, I. Alonso y JR Fernández, **Vídeos de la asignatura de Probabilidad y Estadística**, 1 ed, UVigoTV, 2014
X. Rong Li, **Probability, Random Signals and Statistics**, 1 ed, CRC Press, 1999
R. Cao y otros, **Introducción a la estadística y sus aplicaciones**, 1 ed, Pirámide, 2001

Complementary Bibliography

H. Stark y J.W. Woods, **Probability, Random Processes, and estimation theory for engineers**, 2 ed, Prentice Hall, 1994
D. Peña, **Estadística, modelos y métodos. Tomo 1: Fundamentos**, 2 ed, Alianza Universidad Textos, 1991
P. Peebles, **Principios de probabilidad, variables aleatorias y señales aleatorias**, 4 ed, McGraw-Hill, 2006
A. Papoulis, **Probability, random variables and stochastic processes**, 4 ed, McGraw-Hill, 2002
A. Blasco y S. Pérez-Díaz, **Modelos aleatorios en ingeniería**, 1 ed, Paraninfo, 2015

Recommendations

Subjects that continue the syllabus

Data Communication/V05G301V01204
Computer Networks/V05G301V01210
Signal Transmission and Reception Techniques/V05G301V01208
Basics of bioengineering/V05G301V01415

Subjects that are recommended to be taken simultaneously

(*)Cálculo II/11585-53341

Subjects that it is recommended to have taken before

(*)Álgebra lineal/11585-53337
(*)Cálculo I/11585-53336

IDENTIFYING DATA				
(*)Análisis de circuitos lineales				
Subject	(*)Análisis de circuitos lineales			
Code	11585-53343			
Study programme	(*)Grao en Enxeñaría de Tecnoloxías de Telecomunicación			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Basic education	1st	2nd
Teaching language	#EnglishFriendly Spanish			
Department				
Coordinator	García-Tuñón Blanca, Inés			
Lecturers	García Mateo, Carmen García-Tuñón Blanca, Inés Gómez Araújo, Marta			
E-mail	inesgt@com.uvigo.es			
Web	http://moovi.uvigo.gal			
General description	The course introduces the fundamentals of the lumped circuit principles and abstractions on which the design of electronic systems is based. These include lumped circuit models for sources, resistors, inductors, and capacitors. It intends to present some techniques to analyze (to determine currents and voltages) such systems: conventional analysis (integer-differential analysis, phasors and impedances in sinusoidal regime) and linear systems theory based analysis (by using the Laplace transform). English Friendly subject: International students may request from the teachers: a) resources and bibliographic references in English, b) tutoring sessions in English, c) exams and assessments in English.			

Training and Learning Results	
Code	
B1	Understand and master the basic concepts of linear systems and related functions and transforms, electrical circuit theory, electronic circuits, physical principle of semiconductors and logic families, electronic and photonic devices, materials technology and its application to solve engineering problems.
B12	To learn basic subjects and technologies that enable students to learn new methods and technologies, giving them great versatility to adapt to new situations.
D24	Develop sufficient autonomy to carry out work in the thematic field of Telecommunications in interdisciplinary contexts
D27	Promote cooperative work, communication skills, organization, planning, and acceptance of responsibilities in a multilingual and multidisciplinary work environment that fosters education for equality, peace, and respect for fundamental rights.
D30	Solve problems with initiative, decision-making, creativity, and the ability to communicate and transmit knowledge, skills, and abilities, understanding the ethical and professional responsibility of the Telecommunications Technical Engineer's work.

Expected results from this subject	Training and Learning Results	
	B1	D24
	B12	D27
		D30

Contents	
Topic	
I: Introduction to the circuit analysis	Fundamental and derived magnitudes. Circuit elements. Kirchhoff's laws. Resistors in series. Resistor in parallel. Divider circuits: voltage-divider and current-divider.
II: Techniques of circuit analysis in steady-state continuous regime.	Analysis by the mesh current method. Analysis by the node voltage method. Source transformations. Thévenin and Norton equivalent circuits. Maximum power transfer. Superposition.

III: Reactive elements	Inductors and capacitors. Series-parallel combinations of inductors and capacitors. Inductors and capacitors in steady-state continuous regime. Transient regime. Natural and step response of RL and RC circuits.
IV: Sinusoidal steady-state analysis	Definition and parameters. Rms and medium value. Concepts of phasor and impedance. Mesh and node analysis of steady-state sinusoidal regime networks. Thévenin and Norton equivalent circuits. Ideal transformers. Power expressions and calculations.
V: Circuit analysis in the transformed domain	Steady-state response in a circuit. The transfer function. Laplace transform. Circuit elements in the s domain. Circuit analysis in the s domain.
VI: Frequency selective circuits	Filter concept. Low-pass filters. High-pass filters. Bandpass filters. Bandreject filters.
VII: Two-port circuits	Definition of a two-port circuit. Characteristic parameters. Interconnected two-port circuits. Analysis of the terminated two-port circuit.

Planning

	Class hours	Hours outside the classroom	Total hours
Introductory activities	0.5	0	0.5
Lecturing	25.5	49	74.5
Practices through ICT	12	12	24
Laboratory practical	8	4	12
Problem solving	10	4	14
Problem and/or exercise solving	3	9	12
Systematic observation	1.5	0	1.5
Essay questions exam	2.5	9	11.5

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

Methodologies

	Description
Introductory activities	Presentation of the course: syllabus, bibliography, teaching methodology, and assessment and grading procedures. Through this methodology the competencies CT2 and CT3 are developed.
Lecturing	The goal of this methodology is the presentation of the theoretical contents and the practical assessment about students learning abilities. Different exercises and problems related to the specific subject will be solved during these sessions, by the Professor or the students with his/her support, either individually or working in a group. Through this methodology the competencies CG3, CG4, CE4, CT2 and CT3 are developed.
Practices through ICT	These sessions will consist on a supervised either individual or team problem solving of practical applications related to the theoretical content of the subject. The solutions could be analyzed, checked and compared using computational tools. Through this methodology the competencies CG3, CG4 and CE4 are developed.
Laboratory practical	Practical sessions will be carried out in the hardware lab, assembling and measuring circuits tasks will be covered. Through this methodology the competencies CG3, CG4 and CE4 are developed.
Problem solving	These sessions will consist on a supervised team problem solving of practical applications related to the theoretical content of the subject. Through this methodology the competencies CG3, CG4 and CE4 are developed.

Personalized assistance	
Methodologies	**Description**
Lecturing	Needs and study matter queries of students will be address by the professors on tutoring hours (avaliables at ttps://moovi.uvigo.gal).
Laboratory practical	Professors set the pace of the session and resolve any questions that arise during the realization of practice. Also on the schedule tutoring (avaliable at ttps://moovi.uvigo.gal)., professors address the needs and queries of the students related to laboratory practices.
Practices through ICT	Professors set the pace of the session and resolve any questions that arise during the realization of practice. Also on the schedule tutoring (avaliable at ttps://moovi.uvigo.gal)., professors address the needs and queries of the students related to practices in computer rooms.
Problem solving	Professors set the pace of the session and resolve any questions that arise during the session. Also on the schedule tutoring (avaliable at ttps://moovi.uvigo.gal)., professors address the needs and queries of the students related to problem solving.

Assessment				
	Description	Qualification	Training and Learning Results	
Problem and/or exercise solving	There will be 3 tests in Group A schedule: ECA1, ECA2 and ECA3. The score of each of these three tests will be 2 points. The schedule of the tests will be approved in the CAG and will be available at the beginning of the semester.	60	B1 B12	D30
Systematic observation	Throughout the course, at the end of different practical sessions (practices through ICT and laboratory practices), the subject's teaching staff will propose the resolution of some simple exercises related to the content of the session and previous sessions. Students who participate in the continuous evaluation and solve these exercises may receive a total bonus of up to 0.5 points (Bonus). The bonus received will be added to the final continuous evaluation grade and if the maximum possible grade is exceeded, the final continuous evaluation grade would be truncated by 10.	5	B1 B12	D24 D27 D30
Essay questions exam	Global Test (PG). It will cover all the contents of the subject, both theoretical and practical, and may include multiple choice tests, reasoning questions, problem solving and / or exercises, as well as the development of practical cases. There will be a version of this exam for students who follow the continuous assessment, whose maximum score will be 4 points, and another extended version of it with a score of 10 points for the rest of the students.	40	B1 B12	D30

Other comments on the Evaluation

The student, in agreement to the official academic-year schedule, will have two opportunities during the academic year to pass the course:

1. Ordinary exam at the end of the semester.

Students can freely choose the continuous assessment system described in the previous section, without this excluding the possibility of taking a final exam.

Possible cases:

- Students who only take the final exam: they are graded with the score they have obtained in it (0 to 10 points).
- Students who follow the continuous assessment: they are qualified with the sum of all the scores, truncated by 10:

$$\text{Mark} = \min(\text{ECA1} + \text{ECA2} + \text{ECA3} + \text{Bonus} + \text{PG}, 10)$$

2. Extraordinary exam.

Students who did not pass the course at the end of the semester will have a second opportunity, following the same structure, during the ordinary exam session.

End-of-program exam:

There will be an exam that will cover all the contents of the subject, both theoretical and practical, and that may include multiple choice tests, reasoning questions, problem solving and / or exercises, as well as the development of practical cases. The score achieved in it (between 0 and 10) will be the final grade.

Additional comments:

- Students must attend the practices in the group assigned to them at the beginning of the semester.
- All marks in the evaluation are individual.
- Taking the ECA2 or successive scoring tests and / or any of the final exams will mean that the student will have a different grade than "Not presented".
- The grade obtained in continuous evaluation will be valid only for the academic year in which it is carried out.
- The subject is considered approved if the final grade is equal to or greater than 5.

Re-scheduling of tests.

In case of missing a test, instructors have not any compulsion to rescheduling.

Test results.

Before each test, the date and revision procedure of assigned grading marks will be indicated. Such dates will imply a reasonable delay (in general, not greater than three weeks) between the date of test and the release of the grading marks.

Plagiarism.

Plagiarism is regarded as serious dishonest behaviour. If any form of plagiarism is detected in any of the tests or exams, the final grade will be FAIL (0), and the incident will be reported to the corresponding academic authorities for prosecution.

Use of Generative Artificial Intelligence

In carrying out the academic activities of this subject, the use of generative artificial intelligence (GAI) is allowed. Its use must be carried out in an ethical, critical and responsible manner. In the case of using IAG, any results it provides should be critically evaluated, and any citations or references generated should be carefully verified. It is also recommended to declare the use of the tools used.

Sources of information

Basic Bibliography

James W. Nilsson, **Electric Circuits**, 10, PEARSON, 2014

Material docente, **Página web**, moovi.uvigo.gal,

Complementary Bibliography

J.H. McClellan, R.W. Schafer, M.A. Yoder, **Signal Processing First**, PEARSON, 2003

Recommendations

Subjects that continue the syllabus

Physics: Fundamentals of electronics/V05G301V01201
Signal Transmission and Reception Techniques/V05G301V01208

Subjects that are recommended to be taken simultaneously

(*)Procesado de señales I/11585-53344
Mathematics: Calculus 2/V05G301V01106

Subjects that it is recommended to have taken before

(*)Física general para telecomunicación/11585-53338
Mathematics: Linear algebra/V05G301V01102
Mathematics: Calculus 1/V05G301V01101

Other comments

It is strongly recommended that students are familiar with complex numbers, trigonometric functions, linear equation system solving, elemental function derivatives and computation of simple integrals.

IDENTIFYING DATA				
(*)Procesado de señales I				
Subject	(*)Procesado de señales I			
Code	11585-53344			
Study programme	(*)Grao en Enxeñaría de Tecnoloxías de Telecomunicación			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Mandatory	1st	2nd
Teaching language	#EnglishFriendly Spanish Galician			
Department				
Coordinator	Alonso Alonso, Ignacio Márquez Flórez, Óscar Willian			
Lecturers	Docio Fernández, Laura Márquez Flórez, Óscar Willian			
E-mail	ignacio.alonso@uvigo.es omarquez@uvigo.es			
Web	http://moovi.uvigo.gal			
General description	Digital signal processing is nowadays a feature of most everyday communications and entertainment devices. The aim of this course is to equip students with a mathematical grounding in general signal and systems analysis. In subsequent course subjects, this knowledge will be applied to specific applications of signals and systems, including audio, image, video and voice signals. Objectives cover the following areas: Managing signals and systems mathematically and visually, including learning and applying their properties. Studying the different domains for signal and systems analysis: time domain, frequency domain and Z domain. Learning how to transfer a problem in one domain to a domain in which it is easier to solve. Mastering the concept of filter frequency response and learning to interpret the system function. Understanding the relationship between the poles and zeros of the system function and the frequency response. Acquiring basic notions of filter design in the Z domain. Managing specific digital signal processing software. Applying the above knowledge to simple and practical laboratory examples. English Friendly subject: International students may request from the teachers: a) resources and bibliographic references in English, b) tutoring sessions in English, c) exams and assessments in English.			

Training and Learning Results	
Code	
B7	To know the appropriate techniques for the development and operation of signal processing subsystems.
B12	To learn basic subjects and technologies that enable students to learn new methods and technologies, giving them great versatility to adapt to new situations.
C31	Analyze digital signal processing schemes.
D25	Conceiving Engineering within a framework of sustainable development.
D26	Become aware of the need for continuous quality training and improvement, demonstrating a flexible, open, and ethical attitude toward diverse opinions or situations, particularly regarding non-discrimination based on sex, race, or religion, respect for fundamental rights, accessibility, etc.
D30	Solve problems with initiative, decision-making, creativity, and the ability to communicate and transmit knowledge, skills, and abilities, understanding the ethical and professional responsibility of the Telecommunications Technical Engineer's work.

Expected results from this subject	Training and Learning Results		
	B7	C31	D25
	B12		D26
			D30

Contents
Topic

Topic 1. Introduction	Introduction to the concepts of signal and system and their mathematical representation
Topic 2. Sinusoids	Sinusoidal signals: Frequency, amplitude and phase. Complex exponentials and phasors. Phasor addition rule.
Topic 3. Spectrum representation and Fourier series	Spectrum of a sum of sinusoids. Mathematical expression and graphical plot. Fourier Series analysis of periodic signals.
Topic 4. Sampling, aliasing, and quantization	Concept of sampling and digital frequency. Aliasing. Nyquist theorem. Uniform quantization, Mid-Riser quantizer.
Topic 5. FIR Filters and LTI systems	Introduction to discrete-time systems. Difference equation. Linearity and time-invariance. Block Diagrams. Convolution. Cascaded LTI systems.
Topic 6. Frequency response of FIR filters	Sinusoidal response of FIR systems. Frequency response. Properties. Graphical representation.
Topic 7. The Fourier transform for discrete-time signals	Introduction to the DTFT, properties, examples. Inverse DTFT. DTFT and convolution. Ideal filters.
Topic 8. Z Transform	Definition and properties. Linear-phase filters.
Topic 9. IIR filters	Difference equation, impulse response, and system function. Pole-zero diagram and its relation to the frequency response.

Planning

	Class hours	Hours outside the classroom	Total hours
Introductory activities	1	0	1
Lecturing	32	37	69
Practices through ICT	10	20	30
Problem solving	14	28	42
Discussion Forum	0	2	2
Objective questions exam	1.5	0	1.5
Problem and/or exercise solving	4.5	0	4.5
*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.			

Methodologies

	Description
Introductory activities	Course presentation: syllabus, bibliography, teaching methodology, and assessment system.
Lecturing	Presentation of the main concepts of each topic by the instructor. During the first 5 minutes of each lecture, a student will summarize the key concepts covered in the previous session. Students will actively participate by answering questions posed by the instructor during the lecture and by solving exercises. Students are expected to engage in individual work after class, reviewing the concepts discussed in the classroom and expanding their knowledge based on the topic guide. Students should also identify any doubts that may need to be addressed during personalized tutoring sessions. This methodology contributes to the development of competencies C48, B3, and D3.
Practices through ICT	Application of MATLAB functions and commands related to digital signal processing to the resolution of practical exercises. Identification of doubts that may need to be addressed during personalized tutoring sessions. Software used: MATLAB This methodology contributes to the development of competencies C49, B4, and D2.
Problem solving	Problems and/or exercises related to the content presented in the lectures and referenced in each topic□s guide are proposed. Students solve the problems and/or exercises in advance of the problem-solving class, during which one or more students will explain the resolution process on the blackboard. Identification of doubts that may need to be addressed during personalized tutoring sessions. This methodology contributes to the development of competencies C49, B4, and D2.
Discussion Forum	The course website is accessible through the MooVi e-learning platform (https://moovi.uvigo.gal/). Subscription to this platform, including a photograph, is mandatory. The website provides all relevant information related to the course; continuous assessment grades are published there, and forums are created for students to exchange ideas and discuss questions about the course. This methodology contributes to the development of competencies C48, C49, B3, B4, D2, and D3.

Personalized assistance

Methodologies	Description

Lecturing	Students will have the opportunity to attend personalized tutoring sessions during the office hours established by the instructors at the beginning of the term. This schedule will be published on the course website in MooVi (https://moovi.uvigo.gal) under the section "Faculty and Office Hours". These tutoring sessions will address students questions regarding: * The content covered in lectures, and guidance will be provided on how to study it effectively. * The development of laboratory practices and the use of the associated software. * The problems and/or exercises proposed and solved in class, as well as any additional problems or exercises that may arise as the course progresses. There will also be the possibility of arranging online tutoring sessions by appointment.
Practices through ICT	The same description as in the Lecturing section.
Problem solving	The same description as in the Lecturing section.

Assessment

	Description	Qualification	Training and Learning Results	
Objective questions exam	These tests are a requirement to pass the subject. See details in the "Other comments and second call" section.	0	B7 B12	C31
Problem and/or exercise solving	These tests are a requirement to pass the subject. See details in the "Other comments and second call" section.	100	B7 B12	C31

Other comments on the Evaluation

ASSESSMENT PROCEDURE:

A. Overview
The competencies acquired are assessed through a series of tests grouped into two parts, each with different passing requirements:

1. **Lab Tests**: multiple-choice exams.
2. **Problem-Solving Tests**: problem-solving exams.

To pass the course, both parts must be passed.

- Several tests are administered for each part to obtain an independent grade for each.
- Tests for both parts may be conducted during the class period as well as during the final evaluation periods.
- Once a part is passed, the grade is retained for the entire academic year.
- The Lab Test grade ranges from 0 to 10. If the grade is equal to or greater than 5, the student is considered to have passed the lab component. Additionally, if the lab tests are taken during the class period and the grade is 7 or higher, the lab score will increase the final course grade (see details below).
- The Problem-Solving Test grade also ranges from 0 to 10.
- The **Final Grade** of the course is determined as follows (for both continuous and global assessment):
    - If both parts are passed and the Lab Test grade obtained through continuous assessment (i.e., during the class period) is less than or equal to 7:
        - Final Grade = Problem-Solving Test Grade
    - If both parts are passed and the Lab Test grade obtained during the continuous assessment period is greater than 7:
        - Final Grade = min [10, Problem-Solving Test Grade + ((Lab Test Grade − 7)/3)]
    - If either part is not passed:
        - Final Grade = min [Problem-Solving Test Grade, Lab Test Grade]
    - Since students have multiple opportunities throughout the academic year to take both Lab and Problem-Solving Tests, they may have several grades for each part. When calculating the Final Grade, the highest grade in each part will always be used.

It is also important to note the following:

- In this course, the continuous assessment system allows students to achieve a final grade of 10 without taking the

final exam.

- **A student is considered to be enrolled in continuous assessment from the moment they take any of the Problem-Solving Tests**. In such cases, the student will always receive a recorded grade other than "Absent".

The following sections explain in detail how each part is graded.

B. Details of each evaluable part

B1. Lab Tests

- Objective: To determine whether the student has acquired the set of knowledge and/or skills corresponding to the lab practices, with emphasis on the use of MATLAB for digital signal processing.
- Exam content: The content of the lab manuals and any theory content specified in them.
- Exam type: Multiple-choice questions. MATLAB may be used to solve them.
- Grading: Score from 0 to 10. A minimum score of 5 is required to pass this part of the course. If the score obtained during the lab tests (not in the final exams) is greater than 7, the lab grade contributes to increasing the final grade.
- Assessment method for labs:
    - **Ordinary exam**: To pass the Lab part in the Ordinary exam, there are two non-exclusive mechanisms:
        1. Four tests during the class period (continuous assessment):
            - A multiple-choice test is conducted at the end of each lab session in small groups, except for Lab 0, which will be evaluated differently.
            - Each test is graded from 0 to 10. The lab grade is obtained by calculating a weighted average of the lab grades, with weights of 20%, 20%, 40%, and 20% for Labs 0, 1, 2, and 3 respectively. If this average is equal to or greater than 5, the student is considered to have passed the labs.
            - The exact dates of the tests can be consulted on the course website.
        2. A final exam (Global Assessment). It is a multiple-choice exam covering all labs. A score of at least 5 out of 10 is required to pass.
    - **Extraordinary exam or End-of-Program exam**: A final exam (Global Assessment) covering all labs. A score of at least 5 out of 10 is required to pass.
- Specific considerations:
    - Once the labs are passed, the grade is retained for the entire academic year.

B2. Problem-Solving Tests

- Objective: To verify that the student has acquired the set of knowledge and/or skills of the course and is able to apply them to problem-solving.
- Exam content: Specified in the topic guides, available on the course website under "Content to be assessed". MATLAB knowledge is excluded from these exams.
- Exam type: Problem-solving exam. Books or notes are not allowed. Each exam will specify whether a calculator is permitted.
- Grading: Score from 0 to 10. A minimum score of 5 is required to pass this part.
- Assessment method for the Problem-Solving part:
    - **Ordinary exam**: To pass the Problem-Solving part in the Ordinary exam, there are two non-exclusive mechanisms:
        1. Three tests during the class period, in large group lectures (continuous assessment). Each is graded from 0 to 10 and **attendance at all three is mandatory**.
            - The problem-solving grade is calculated as p1*Test1 + p2*Test2 + p3*Test3
            - Weight p1 is 0.25.
            - Weight p2 is 0.35 if the second test grade is 3 out of 10 or higher. Otherwise, p2 is 0.
            - Weight p3 is 0.40 if the third test grade is 3 out of 10 or higher. Otherwise, p3 is 0.
            - The exact dates of the tests can be consulted on the course website.

2. A final exam (Global Assessment). A score of at least 5 out of 10 is required to pass.

- **Extraordinary exam or End-of-Program exam:** A final exam (Global Assessment). A score of at least 5 out of 10 is required to pass.

- Specific considerations:
  - Once a score of at least 5 is obtained, it is retained for the entire academic year.
  - In the Ordinary exam, if this part is passed during continuous assessment, students may retake it in the final exam of the Ordinary exam to improve their grade.
  - If this part is passed in the Ordinary exam, students may NOT retake it in the Extraordinary exam to improve their grade.

C. Clarifications and other considerations

- At the end of the course, students will have a single final grade recorded in their academic transcript.
  - Once the Ordinary exam has concluded, the grade obtained by the student at that point will be recorded, and it is final if it is equal to or greater than 5.
  - If a student who did not pass the course in the Ordinary exam obtains a better grade in the Extraordinary one, the new grade will be recorded. If not, the previous grade remains. In any case, this grade becomes final.
- Continuous assessment exams are not repeatable; if a student is unable to take them during the scheduled time, the instructors are not obligated to reschedule them unless a justified and documented reason is provided.
- The grades obtained in the Lab and Problem-Solving parts are only valid for the current academic year.
- If a calculator is allowed in any of the Problem-Solving exams, only a conventional scientific calculator may be used. Calculators capable of storing formulas or equipped with libraries for automatic operations with complex numbers, root calculations, etc., are not permitted.
- Plagiarism is regarded as serious dishonest behavior. If any form of plagiarism is detected in any of the tests or exams, the final grade will be FAIL (0), and the incident will be reported to the corresponding academic authorities for prosecution.
- Throughout the course, instructors may occasionally propose activities or exercises in which students may earn bonus points. The total amount of bonus points offered may vary from year to year and will not exceed 1 point out of 10. If awarded, the bonus will be added to the final grade obtained according to the described evaluation method.
- English Friendly program content: International students may request from the teaching staff: a) materials and bibliographic references in English to follow the course, b) to attend office hours in English, c) tests and assessments in English.

Sources of information

Basic Bibliography

J.H. McClellan, R.W. Schafer, Mark A. Yoder, **DSP First, Global Edition**, Pearson Prentice Hall, 2016

Complementary Bibliography

A. Quarteroni y F. Saleri, **Cálculo científico con Matlab y Octave**, Springer,
M. J. Roberts, **Señales y Sistemas**, McGraw Hill,
A.V. Oppenheim y R.W. Schafer, **Tratamiento de señales en tiempo discreto**, Prentice Hall,

Recommendations

Subjects that are recommended to be taken simultaneously

(*)Análisis de circuitos lineales/11585-53343
(*)Cálculo II/11585-53341

Subjects that it is recommended to have taken before

(*)Álgebra lineal/11585-53337
(*)Cálculo I/11585-53336

IDENTIFYING DATA				
(*)Programación I				
Subject	(*)Programación I			
Code	11585-53345			
Study programme	(*)Grao en Enxeñaría de Tecnoloxías de Telecomunicación			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Mandatory	1st	2nd
Teaching language	#EnglishFriendly Spanish Galician			
Department				
Coordinator	García Méndez, Silvia			
Lecturers	Fernández Masaguer, Francisco García Méndez, Silvia Mikic Fonte, Fernando Ariel Sousa Vieira, Estrella			
E-mail	sgarcia@gti.uvigo.es			
Web	http://moovi.uvigo.gal			
General description	The aim of the course is to provide students with basic skills to program in a high-level language. The programming paradigm followed is that of structured programming. English Friendly subject: International students may request from the teachers: a) resources and bibliographic references in English, b) tutoring sessions in English, c) exams and assessments in English.			

Training and Learning Results	
Code	
C7	Know and make use of the fundamentals of programming in networks, systems and telecommunication services.
C35	Develop programs according to the basic principles of software engineering quality, taking into account the main existing sources of norms, standards and specifications.
D1	Demonstrate autonomy to learn new knowledge and techniques appropriate to the design, development or operation of telecommunication systems and services.
D25	Conceiving Engineering within a framework of sustainable development.
D27	Promote cooperative work, communication skills, organization, planning, and acceptance of responsibilities in a multilingual and multidisciplinary work environment that fosters education for equality, peace, and respect for fundamental rights.
D30	Solve problems with initiative, decision-making, creativity, and the ability to communicate and transmit knowledge, skills, and abilities, understanding the ethical and professional responsibility of the Telecommunications Technical Engineer's work.
D32	Work in a multidisciplinary group and in a multilingual environment and communicate, both in writing and orally, knowledge, procedures, results and ideas related to telecommunications and electronics.

Expected results from this subject	Training and Learning Results	
	C7	D1
	C35	D25
		D27
		D30
		D32

Contents	
Topic	
Lecture 1: The algorithm and the programming languages	1. A computer□s structure and operation 2. How the program gets into the computer 3. C programming language 4. The process of developing programs 5. Simple programming examples 6. Software engineering concepts

Lecture 2: Grammar and basic elements of C language	1. Basic elements of a C program 2. Identifiers 3. Expressions 4. Declaration and initialization 5. The assignment statement 6. Formatted input/output
Lecture 3: Iteration and selection statements	1. Control statements 2. Decision statements: (a) if statement (b) if-else statement (c) switch statement 3. Iteration statements: (a) do-while statement (b) while statement (c) for statement 4. Statements for altering the control flow: break and continue
Lecture 4: Arrays and pointers	1. Data structures 2. Arrays: (a) one-dimensional arrays (b) two-dimensional arrays 3. Strings 4. Copy of arrays
Lecture 5: Functions	1. Function declaration and definition 2. Functions with no parameters 3. C inter function communication: local, global and static variables 4. Functions with parameters by value
Lecture 6. Pointers	1. Pointers 2. Pointer arithmetic 3. Dynamic memory allocation 4. Arrays and pointers 5. Pointers to pointers 6. Functions with parameters by reference 7. Command line arguments
Lecture 7: Files	1. Introduction: types of files 2. Text files in C 3. Declaration 4. File opening and closing 5. File management 6. Operations on characters 7. Operations on strings 8. Formatted operations
Lecture 8: Structured type variables	1. Introduction: Structured data types 2. struct type. Declaration 3. struct type. Operations 4. Pointers and struct type 5. Struct as parameters 6. Creation of data types
Lecture 9: Lists	1. Introduction: The need for dynamic data structures 2. Dynamic data structures 3. Linked lists: (a) types (b) most common operations

Planning

	Class hours	Hours outside the classroom	Total hours
Introductory activities	2	0	2
Lecturing	24	24	48
Laboratory practical	30	20	50
Laboratory practice	4	20	24
Objective questions exam	2	18	20
Problem and/or exercise solving	1	5	6

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

Methodologies

	Description
Introductory activities	Introduction to theoretical and practical activities.
Lecturing	Professors present the main theoretical contents related to the subject. These sessions can include the development of works and programs by the students. Through this methodology the competencies D25 and C7 are developed.

Laboratory practical	During the first part of the term, the students codify, compile, and document simple programs guided by the professors. In the laboratory, the Ubuntu Linux operating system and the gcc compiler will be used. Some of these activities can require the submission of a report in order to be evaluated. Through this methodology the competencies D1, D25, D27, D30, D32, C7, and C35 are developed.

Personalized assistance	
Methodologies	**Description**
Lecturing	Professors will provide individualized and personalized support to each student throughout the academic term, addressing their questions and concerns. Doubts will be addressed either in person or online (during the lecture sessions themselves or during the scheduled office hours). The office hours of the professors can be consulted on their respective profiles in Moovi: García Méndez, Silvia: https://moovi.uvigo.gal/user/profile.php?id=11600
Laboratory practical	Professors will provide individualized and personalized support to each student throughout the academic term, addressing their questions and concerns. In addition, professors will guide and assist each student during the completion of the tasks assigned in the laboratory sessions. Questions will be addressed either in person or online (during the lab sessions or during the scheduled office hours). The office hours of the teaching staff can be consulted on their respective profiles in Moovi: Fernández Masaguer, Francisco: https://moovi.uvigo.gal/user/profile.php?id=11316 Mikic Fonte, Fernando Ariel: https://moovi.uvigo.gal/user/profile.php?id=11299 Sousa Vieira, Estrella: https://moovi.uvigo.gal/user/profile.php?id=11585

Assessment				
	Description	Qualification	Training and Learning	Results
Laboratory practice	The student will take two midterm laboratory tests consisting in the development of small programs on the computer. Each of these tests will assess the student's progress on a portion of the laboratory practical exercises. The final laboratory test will assess the student's progress on the practical exercises as a whole.	50	C7 C35	D1 D25 D27 D30 D32
Objective questions exam	The student will take one midterm theoretical test that may consist of short answer questions and multiple choice questions. This exam will assess individually the student's mastery of the concepts introduced in the lecture sessions. The final theoretical exam will also contain this type of questions.	40	C7	D30
Problem and/or exercise solving	The theoretical exams will have a part consisting of problem and/or exercise solving.	10	C7	D30

Other comments on the Evaluation

Following the guidelines specific to the degree program, each student will have 2 opportunities (the **ordinary** and **extraordinary** calls) to pass the course.

Furthermore, in the ordinary call, there will be 2 evaluation procedures (**continuous** and **global**).

ASSESSMENT TESTS

Throughout the semester, several intermediate assessment tests will be given. Specifically, there will be two **Midterm LaboratoryTests** (PL1 and PL3) and one **Midterm TheoreticalTest** (PT2). The schedule of the different intermediate assessment tests will be approved by the Academic Degree Committee (CAG) and will be available at the beginning of the semester.

During the regular examination period of the School, the **Final Theoretical Test** (ETF) and the **Final Laboratory Test** (ELF) will be given.

During the extraordinary examination period of the School, the **Extraordinary Theoretical Test** (ETX) and the **Extraordinary Laboratory Test** (ELX) will be given.

Each theoretical test may include short-answer and/or multiple-choice questions, as well as problem-solving and/or exercise resolution questions. It assesses students' knowledge of the content covered in the lectures.

All the practical exercises are mandatory. Prior to each laboratory test, it will be necessary to have uploaded to Moovi all the corresponding assignments for that test. Each laboratory test consists of making modifications to the submitted practical exercises. It evaluates those submitted practical exercises.

ORDINARY CALL

Each student taking this course may choose between the 2 evaluation procedures: continuous assessment and global assessment.

Taking the second midterm test (PT2) will be interpreted as the decision to choose continuous assessment. No taking it will be interpreted as the decision to choose global assessment.

CONTINUOUS ASSESSMENT

The condition for passing the course using the continuous assessment procedure is obtaining a final grade (NFC) equal to or higher than 5.

The final grade for continuous assessment will be calculated as the weighted arithmetic mean of the midterm and final test grades. It will be given by the following expression:

NFC = 0.6 NPP + 0.2 ETF + 0.2 ELF

Where:

NPP is the Midterm Test Grade, calculated as the weighted arithmetic mean of all midterm tests, according to the following expression: NPP = (1PL1 + 3PT2 + 2*PL3) / 6.

ETF is the grade obtained on the Final Theoretical Test.

ELF is the grade obtained on the Final Laboratory Test.

A minimum grade of 2.5 points will be required in the three components of this grade (NPP, ETF, and ELF). If the student fails to reach this minimum in any of them, the final grade for continuous assessment will be at most 4.0 (fail).

Continuous assessment consists of the tests detailed in this guide, which are not recoverable. In other words, if a student cannot complete them within the specified timeframe, the teaching staff is not obliged to repeat them.

Before each test, the date and procedure for reviewing the grades will be indicated. Students will have the option to know the grade of each test and review the correction within approximately 2 weeks.

GLOBAL ASSESSMENT

The condition for passing the course using the global assessment procedure is obtaining a final grade (NFG) equal to or higher than 5.

This method will consist of the same final tests as the continuous assessment, although with different weights. The final grade for global assessment will be given by the following expression:

NFG = (ETF + ELF) / 2

A minimum grade of 2.5 points will be required in the two components of this grade (ETF and ELF). If the student fails to reach this minimum in any of them, the final grade for global assessment will be at most 4.0 (fail).

Each student taking the final tests for the course will have both grades calculated: the final grade for continuous assessment (NFC) and the final grade for global assessment (NFG). The higher of the two grades will be awarded as the final grade in the ordinary call.

The grade will be "No-show" if the student does not attend any test after the first Midterm Test (PL1).

EXTRAORDINARY CALL

Each student who does not pass the course in the ordinary call will have a second opportunity.

In the extraordinary call, the condition for passing the course is obtaining a final grade (NFX) equal to or higher than 5.

The final grade in the extraordinary call will be given by the following expression:

NFX = (NTX + NLX) / 2

Where:

NTX is the Extraordinary Theoretical Grade: if the student takes the Extraordinary Theoretical Test, NTX will be the grade obtained in that test: NTX = ETX. If not, NTX will be the theoretical grade obtained in the ordinary call: NTX = 0.6 PT2 + 0.4 ETF, as long as in ETF the obtained score is of 2.5 or more, otherwise the NTX must be taken.

NLX is the Extraordinary Laboratory Grade: if the student takes the extraordinary Laboratory Test, NLX will be the grade obtained in that test: NLX = ELX If not, NLX will be the laboratory grade obtained in the ordinary call: NLX = 0.2 PL1 + 0.4 PL3 + 0.4 ELF, as long as in ELF the obtained score is of 2.5 or more, otherwise the NLX must be taken.

A minimum grade of 2.5 points will be required in the two components of this grade (NTX and NLX). If the student fails to reach this minimum in any of them, the final grade in the extraordinary call will be at most 4.0 (fail).

END-OF-PROGRAM TEST

Following the guidelines specific to the degree program, students who have 3 or fewer courses remaining to graduate will have end-of-program test call in those courses.

In the end-of-program test call, the condition for passing the course is obtaining a final grade (NFX) equal to or higher than 5.

In this call, a test with short-answer and/or multiple-choice questions, as well as problem-solving and/or exercise resolution questions, will be conducted (End-of-program Theoretical Test, ETZ), and a laboratory test evaluating the lab work (End-of-program Laboratory Test, ELZ). The final grade in the end-of-program test call will be given by the following expression:

NFZ = (ETZ + ELZ) / 2

A minimum grade of 2.5 points will be required in the two components of this grade (ETZ and ELZ). If the student fails to reach this minimum in any of them, the final grade in the end-of-program test call will be at most 4.0 (fail).

The grade obtained in any of the assessable tasks will be valid only for the academic year in which they are performed, meaning that no grade is carried over from one year to the next.

If plagiarism is detected on any of the assignments/tests, the grade will be Fail (0), and the teaching staff will report the incident to the School's administration for appropriate action to be taken.

The use of generative artificial intelligence (GAI) is permitted in the completion of academic activities for this subject. Its use must be ethical, critical, and responsible. If GAI is used, any results it provides should be critically evaluated, and any generated citations or references must be carefully verified. Additionally, it is recommended to disclose the tools used.

Sources of information

Basic Bibliography

Manuel Caeiro Rodríguez, Enrique Costa Montenegro, Ubaldo García Palomares, Cristina López Bravo, J, **Practicar Programación en C**, 978-84-8408-746-5, Andavira, 2014

José Rafael García-Bermejo Giner, **Programación Estructurada en C**, 978-84-8322-423-6, Prentice HallPearson Prentice Hall, 2008

Stephen G. Kochan, **Programming in C**, 0-672-32666-3, 3, Sams Publishing, 2005

Complementary Bibliography

Cairo Battistutti O, Ocampo Botello F, **Fundamentos de programación: piensa en C**, 970-26-0810-4, 1, Pearson Education, 2006

https://www.programiz.com/c-programming, **Learn C Programming**, 2021

https://www.tutorialspoint.com/cprogramming/, **Learn C Programming**, 2021

Ignacio Alvarado Aldea, Jose María Maestre Torreblanca, Carlos Vivas Venegas, Ascensión Zafra Cabeza, **100 Problemas Resueltos de Programación en Lenguaje C para Ingeniería**, 978-84-283-3969-8, Paraninfo, 2017

Recommendations

Subjects that continue the syllabus

Programming II/V05G301V01110

Subjects that are recommended to be taken simultaneously

(*)Arquitectura de ordenadores/11585-53339

Subjects that it is recommended to have taken before

(*)Arquitectura de ordenadores/11585-53339

Other comments

Programming II course continues this course.