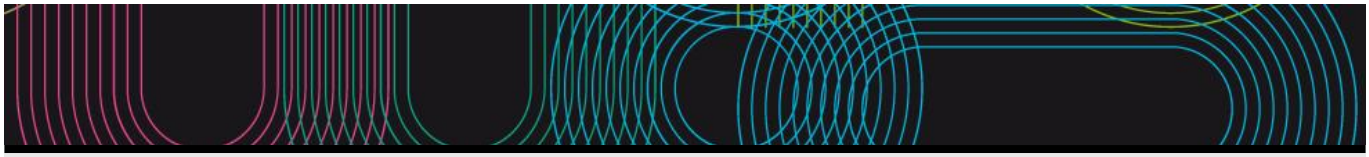

(*)Escola de Enxeñaría de Telecomunicación

(*)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

Director: Íñigo Cuíñas Gómez (teleco.direccion@uvigo.es)

Subdirección de Relaciones Internacionales: Enrique Costa Montenegro (teleco.subdir.internacional@uvigo.es)

Subdirección de Extensión: Francisco Javier Díaz Otero (teleco.subdir.extension@uvigo.es)

Subdirección de Organización Académica: Manuel Fernández Veiga (teleco.subdir.academica@uvigo.es)

Subdirección de Calidad: Loreto Rodríguez Pardo (teleco.subdir.calidade@uvigo.es)

Secretaría y Subdirección de Infraestruturas: Miguel Ángel Domínguez Gómez (teleco.subdir.infraestructuras@uvigo.es)

BACHELOR'S DEGREE IN TELECOMMUNICATION TECHNOLOGIES ENGINEERING

General coordinator: Rebeca Díaz Redondo (teleco.grao@uvigo.es)

http://teleco.uvigo.es/images/stories/documentos/comisions/membros_comisions_grao.pdf

MASTER IN TELECOMMUNICATION ENGINEERING

General coordinator: Manuel Fernández Iglésias (teleco.master@uvigo.es)

http://teleco.uvigo.es/images/stories/documentos/comisions/membros_comisions_master.pdf

MASTER IN CYBERSECURITY

General coordinator: Ana Fernández Vilas (camc@uvigo.es)

http://teleco.uvigo.es/images/stories/documentos/comisions/membros_comisions_master_ciberseguridade.pdf

MASTER IN INDUSTRIAL MATHEMATICS

General coordinator: Elena Vázquez Cendón (USC)

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

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

INTERNATIONAL MASTER 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/

Degree in Telecommunication Technologies Engineering-English teaching

Subjects			
Year 1st			
Code	Name	Quadmester	Total Cr.
V05G306V01101	Mathematics: Calculus 1	1st	6
V05G306V01102	Mathematics: Linear algebra	1st	6
V05G306V01103	Physics: Fundamentals of Mechanics and Thermodynamics	1st	6
V05G306V01104	Business: Company Fundamentals	1st	6
V05G306V01105	Programming I	1st	6

V05G306V01106	Mathematics: Calculus 2	2nd	6
V05G306V01107	Mathematics: Probability and Statistics	2nd	6
V05G306V01108	Physics: Analysis of Linear Circuits	2nd	6
V05G306V01109	Informatics: Computer Architecture	2nd	6
V05G306V01110	Programming II	2nd	6

IDENTIFYING DATA

Mathematics: Calculus 1

Subject	Mathematics: Calculus 1			
Code	V05G306V01101			
Study programme	Degree in Telecommunication Technologies Engineering-English teaching			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Basic education	1st	1st
Teaching language	Spanish Galician			
Department				
Coordinator	González Rodríguez, Ramón			
Lecturers	Calvo Ruibal, Natividad Fernández Manin, Generosa González Rodríguez, Ramón			
E-mail	rgon@dma.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.			

Skills

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

Learning outcomes

Expected results from this subject	Training and Learning Results		
Understanding of the basic concepts of the differential calculation in one and several variables.	B3 B4	C1	D2 D3
Knowledge and handle of the usual differential operators of the mathematical physics.		C1	
Knowledge and handle of the technicians of differential calculation for the research of extremes, the local approximation of functions and the numerical resolution of systems of equations.	B4	C1	D2
Knowledge of some computer program of symbolic calculation and graphic representation.	B3		D3

Contents

Topic	
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. Continuity of functions of several variables.	n-dimensional space. Scalar product, norm. Vector product. Functions of several variables. Limits. Continuity. Bolzano's theorem.

Topic 4. Coordinate systems for the plane and space.	Polar, cylindrical, and spherical coordinates.
Topic 5. Derivatives of functions of one variable and applications of the derivative.	Derivatives of a function in 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 6. Differential of functions of several variables.	Directional derivatives. Partial derivatives. Jacobian matrix. The chain rule. Higher order derivatives. Differential operators.
Topic 7. Applications of the differential calculus.	Extreme values. Extreme values with equality constraints. Newton's method.

Planning

	Class hours	Hours outside the classroom	Total hours
Lecturing	38	66.5	104.5
Problem solving	10	14	24
Laboratory practical	2	1.5	3.5
Problem and/or exercise solving	4	8	12
Problem and/or exercise solving	2	4	6

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

Methodologies

	Description
Lecturing	The teacher will expose the theoretical contents of the matter. Through this methodology competencies CG3, CE1 and CT3 are developed.
Problem solving	The teacher will solve problems and exercises of each of the topics and the student will have to solve similar exercises. Through this methodology competencies CG3, CG4, CE1, CT2 and CT3 are developed.
Laboratory practical	The students will use computer tools (Maxima and/or Matlab) to solve exercises and apply the knowledge achieved in the theoretical classes. Through this methodology competencies CG3, CG4, CE1, CT2 and CT3 are developed.

Personalized assistance

Methodologies	Description
Lecturing	The teacher will discuss personally the doubts and queries of the students in the schelude of personal tutorials 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 teacher will discuss personally the doubts and queries of the students in the schelude of personal tutorials 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	First session (1 hour): Topics 1 and 2. Second session (1 hour): Topics 3 and 4. Third session (1 hour): Topic 5. Fourth session (1 hour): Topic 6. The four previous sessions give 50% of the course mark. Individual assessment.	10 12.5 10 17.5 50	B3 B4	C1
Problem and/or exercise solving	Final exam on topics 4, 6, and 7 of the subject. Its grading will be 50% of the course mark. Individual assessment.	50	B4	C1

Other comments on the Evaluation

Following the guidelines of the degree, two evaluation systems will be offered to the students: continuous assessment or exam-only assessment.

1. Continuous assessment

In order to opt for continuous assessment the student should complete a registration form for this type of evaluation and deliver it to the course Mathematics: Calculus 1 in Moovi platform before the date in which the second session will take place. After then it will not be possible to change the option of evaluation. Continuous assessment consists of the previous four one-hour sessions detailed and a final exam. If a student cannot attend a particular test on the date for which it is scheduled, he or she will miss that test.

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

N = (1/10) x C + (5/10) x E

C: grading, between 0 and 50, obtained as the sum of the marks of the four one-hour sessions.

E: grading, between 0 and 10, obtained in the final exam on the topics 4, 6, and 7 of the subject.

In this mode, a student has successfully completed the course when **N** is greater than or equal to 5. Gradings obtained in the tests will be valid only for the academic year in which they are done.

2. Exam-only assessment and end-of-program call

Those students who do not choose to be graded by continuous assessment, will be graded by means of a final exam (topics: 1, 2, 3, 4, 5, 6, and 7) which will not necessarily be the same as the one for the students who chose continuous assessment. This exam will be graded in a scale of 10 points and the passing grade cutoff will be 5.

3. Second call

On the day of this second final exam, the students who were graded by continuous evaluation may choose to be graded exclusively by this second exam or to be graded taking into account the points obtained in their continuous evaluation by the same formula used earlier, that is:

NR= (1/10) x C + (5/10) x D

C: Mark, between 0 and 50, obtained as the sum of the gradings of the one-hour sessions.

D: Mark, between 0 and 10, obtained in an exam on the topics 4, 6, and 7 of the subject.

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

Those students who choose to be graded exclusively by the second final exam on topics: 1, 2, 3, 4, 5, 6, and 7 which will not necessarily be the same as the one for the students who made the other choice. This exam will be graded in a scale of 10 points and the passing grade cutoff will be 5.

4. Qualification of ''No Presentado''

A student will obtain a qualification of ''No Presentado'' if the student did not choose continuous evaluation and did not attend the final exams.

5. Ethical behaviour

It is expected a correct and ethical behavior 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 behavior 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.

6. English Friendly

English Friendly subject: International students may request from the teachers: a) materials and blbliographic references in English, b) tutoring sessions in English, c) exams and assesments in English.

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

Physics: Analysis of Linear Circuits/V05G301V01108
Mathematics: Calculus 2/V05G301V01106
Mathematics: Probability and Statistics/V05G301V01107
Physics: Fields and Waves/V05G301V01202
Digital Signal Processing/V05G301V01205
Electromagnetic Transmission/V05G301V01207

Subjects that are recommended to be taken simultaneously

Mathematics: Linear algebra/V05G301V01102

Contingency plan

Description

In the case of online tuiton the planning of the course will keep on being the same. The attention to the students will make only by telematic means using the platforms that the University of Vigo will put to the service of the university community. The evaluation will be coincident with the contained in the point 7 of this guide. The assessment test will make all using the quoted platforms.

Finally some new bibliographical resources available in the telematics platform of the University should be provided to the students.

IDENTIFYING DATA				
Mathematics: Linear algebra				
Subject	Mathematics: Linear algebra			
Code	V05G306V01102			
Study programme	Degree in Telecommunication Technologies Engineering-English teaching			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Basic education	1st	1st
Teaching language	Spanish			
Department				
Coordinator	Martín Méndez, Alberto Lucio			
Lecturers	Bajo Palacio, Ignacio Calvo Ruibal, Natividad Martín Méndez, Alberto Lucio			
E-mail	amartin@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 Spaces which will be needed in later subjects. Special attention will be paid to the applications of Linear Algebra.			

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

Learning outcomes			
Expected results from this subject	Training and Learning Results		
Skill development the basic operations of matrix algebra.	B3 B4	C1	D2 D3
Knowledge of numerical methods for solving systems of linear equations and knowledge of the basic concepts involving vector spaces and linear maps.	B3		D3
Knowledge of the properties of vector spaces with inner product.		C1	
Skill development some applications of linear algebra: the method of least squares, singular value decomposition and classification of quadratic forms	B3	C1	D3
To know the arithmetic of complex numbers.	B3 B4	C1	D2 D3

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, determinants and systems of linear equations	Matrix operations: addition, scalar multiplication and product of matrices. Matrix inverse. Block matrices. Determinants. Systems of linear equations. Elementary row operations and Gauss method. Numerical methods for systems of linear equations.

Topic 3. Vector Spaces and Linear transformations	Linear independence. Subspaces. Basis. Dimension. Rank of a system of vectors and rank of a matrix. Introduction to linear transformations. Matrix of a linear transformation.
Topic 4. Matrix diagonalization.	Eigenvalues and eigenvectors. Eigenspace. Matrix diagonalization and diagonalizable matrices.
Topic 5. Orthogonallity.	Real Euclidean inner product. Complex Hermitian inner product. Orthogonallity. Gram-Schmidt. 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	38	76	114
Problem solving	9	9	18
Problem and/or exercise solving	5	5	10
Essay questions exam	2	2	4

*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. Through this methodology the competences CG3, CG4, CE1, CT2 and CT3 are developed.
Lecturing	Explanation and development by the teacher of the contents of the various topics in the syllabus. Through this methodology the competences CG3, CE1 and CT3 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 CG3, CG4, CE1, CT2 and CT3 are developed.

Personalized assistance

Methodologies	**Description**
Problem solving	Personalized tutoring will be available from all the teachers of the subject.
Laboratory practical	Personalized tutoring will be available from all the teachers of the subject.
Lecturing	Personalized tutoring will be available from all the teachers of the subject.
Tests	**Description**
Problem and/or exercise solving	Personalized attention will be available for assistance in the revision of tests and exams.

Assessment

	Description	Qualification	Training and Learning Results	
Problem and/or exercise solving	Continuous evaluation consists in four short tests to be given in the class hour. The approximate planning will be the following: 1. Exam of topic 1. 2. Exam of topic 2 and 3. 3. Exam of topic 4. 4. Exam of topic 5. All the tests will have a weight of 12,5% in the final grade. The total weight of the continuous evaluation in the final grade will therefore be of 50%. The planning of the different intermediate evaluation tests will be approved in an Academic Commission of Degree and it will be available at the beginning of the semester.	50	B3 B4	C1
Essay questions exam	A written two-hour exam of topics 1, 2, 3, 4, and 5 at the end of the semester in date, time and venue determined in the official exams calendar of the School.	50	B3 B4	C1

Other comments on the Evaluation

First call:

Continuous assessment:

The final grade is calculated by the formula:

$$M = \max \{EF, (1{,}25 \times (E1 + E2 + E3 + E4)) + 5\, EF) / 10\}$$

where E1, E2, E3 y E4 are the points, in a scale 0 to 10, obtained in the four tests of the continuous evaluation and where EF represents the points, in a scale 0 to 10, obtained in the final exam. A passing grade is N greater or equal to 5. Before doing each test, the procedure and date of revising the grading of that test will be announced. After the test, the grades will be announced in a reasonable amout of time. If a student, for any circumstance, cannot attend a particular test on the date for which it is scheduled, he or she will miss that test and it will not be repeated.

The points obtained in the tests of continuous evaluation will be valid only for the academic year in which they are obtained.

Eventual assessment**:**

The students who do not choose to be graded by continuous evaluation, will be graded by means of a final exam of all the topics of the subject. This exam will be graded in a scale of 10 points and the passing grade cutoff will be 5.

Second call:

The students who at the end of the semester do not obtain a passing grade will have the opprtunity of writing a second final exam on date, time and venue determined in the official exams calendar of the School. This exam will cover topics 1, 2, 3, 4 and 5. The final grade is calculated by the formula

$$M = \max \{EFR, (1{,}25 \times (E1 + E2 + E3 + E4)) + 5\, EFR) / 10\}$$

where now EFR is the grade, in a scale 0 to 10, in the second final.

Remark: During the exam correction period some students could be contacted by phone or telematically by the teacher to clarify aspects of their answers; in that case, such answers may have an impact on the exam grade.

"No presentado":

A student will obtain a grade of "No Presentado" in the first edition of the final grades if that student did not attend the final exam.

A student will obtain a grade of "No Presentado" in the second edition of the final grades if and only if that student obtained "No Presentado" in the first edition and did not attend the second final.

Extraordinary call:

The students which attend the Extraordinary call will write an exam covering topics 1, 2, 3, 4 and 5 which will be graded in a scale of 10 points and the passing grade cutoff will be 5. Individual assessment.

Ethical Behavior:

It is expected a correct and ethical behavior of all students in all written tests and exams, which are meant to truly reflect the knowledge and abilities attained by each studen. Any unethical behavior detected in a particular test (such as copying or using prohibited material) will result in a grading of 0 in that test and the issue of the corresponding report for the School Director's Office.

Sources of information

Basic Bibliography

D. Poole, **Álgebra lineal: Una introducción moderna**, 978-9706865953, 2º, Cengage Learning Editores S.A., 2006

L. Merino; E. Santos, **Álgebra lineal con métodos elementales**, 9788497324816, 1ª, Paraninfo, 2006

J. de Burgos, **Álgebra lineal y geometría cartesiana**, 84-481-2437-5, 2ª, McGraw-Hill/Interamericana de España, S. A. U., 2000

Complementary Bibliography

D. C. Lay, **Álgebra lineal y sus aplicaciones**, 978-970-26-0906-3, 3ª, Pearson Educación, 2007

Recommendations

Subjects that continue the syllabus

Physics: Analysis of Linear Circuits/V05G301V01108
Mathematics: Calculus 2/V05G301V01106

Subjects that are recommended to be taken simultaneously

Mathematics: Calculus 1/V05G301V01101

Contingency plan

Description

If teaching is totally online, continuous evaluation consists in two short tests and also some homework. The approximate planning of the two tests will be the following:
1. Exam of topics 1, 2 and 3.
2. Exam of topics 4 and 5.
Bothn tests will have a weight of 20% in the final grade and the homework will have a weight of 10% in the final grade.
The total weight of the continuous evaluation in the final grade will therefore be of 50%.
The planning of the different intermediate evaluation tests will be approved in an Academic Commission of Degree and it will be
available at the beginning of the semester.

The teaching and the rest of the evaluation will follow its planning, but it will be carried out through the technical means provided by the UVIGO

IDENTIFYING DATA				
Physics: Fundamentals of Mechanics and Thermodynamics				
Subject	Physics: Fundamentals of Mechanics and Thermodynamics			
Code	V05G306V01103			
Study programme	Degree in Telecommunication Technologies Engineering-English teaching			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Basic education	1st	1st
Teaching language	English			
Department				
Coordinator	Chiussi , Stefano			
Lecturers	Chiussi , Stefano Fernández Doval, Ángel Manuel			
E-mail	schiussi@uvigo.es			
Web	http://moovi.uvigo.gal			
General description	Introduction to the basic concepts on the general laws of Mechanics and Thermodynamics as well as to their application to the resolution of problems in engineering. "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.			

Skills	
Code	
B3	CG3: The knowledge of basic subjects and technologies that enables the student to learn new methods and technologies, as well as to give him great versatility to confront and adapt to new situations
B5	CG5: The knowledge to perform measurements, calculations, assessments, appraisals, technical evaluations, studies, reports, task scheduling and similar work to each specific telecommunication area.
B6	CG6: The aptitude to manage mandatory specifications, procedures and laws.
C3	CE3/FB3: Comprehension and command of basic concepts about the general laws of mechanics, thermodynamics, electromagnetic fields and waves and electromagnetism and their application to solve Engineering problems.
D3	CT3 Awareness of the need for long-life training and continuous quality improvement, showing a flexible, open and ethical attitude toward different opinions and situations, particularly on non-discrimination based on sex, race or religion, as well as respect for fundamental rights, accessibility, etc.

Learning outcomes			
Expected results from this subject	Training and Learning Results		
Understanding and mastering of the basic concepts on the general laws of Mechanics and of Thermodynamics.	B3	C3	
Ability to use the basic instrumentation to measure physical quantities.	B3 B5 B6	C3	D3
Ability to evaluate experimental data.	B3 B5	C3	
Ability to solve the elementary technical problems in engineering.	B3	C3	

Contents
Topic
1.- Physical quantities and units. The International System.
2.- Vectorial tools for Mechanics.
3.- Point Kinematics.
4.- Point Kinetics.
5.- Statics.
6.- Oscillations.
7.- Wave motion.
8.- Zero principle of Thermodynamics. Temperature.

9.- First principle of Thermodynamics.
10.- Second principle of Thermodynamics.
Lab 1.- Measurement instruments. Error and uncertainty. Estimation of uncertainties in direct measurements.
Lab 2.- Measurement of the reaction time to a given stimulus. Measurement of the gravitational acceleration by means of a pendulum. Estimation of uncertainty in indirect measurements.
Lab 3.- Verification of Hooke's Law. Linear fit.
Lab 4.- Longitudinal and transversal standing waves. Measurements by linearization of non-linear relations and linear fit. Graphical representation of measurement results.
Lab 5.- Simple harmonic motion. Free standing oscillation of a spring. Measurements by linearization of non-linear relations and linear fit. Graphical representation of measurement results.

Planning

	Class hours	Hours outside the classroom	Total hours
Lecturing	28	34	62
Problem solving	15.5	46.5	62
Laboratory practical	9	13.5	22.5
Essay questions exam	1	0	1
Problem and/or exercise solving	1.25	0	1.25
Report of practices, practicum and external practices	1.25	0	1.25
*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 CG3, CE3, CG5, CG6 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 CG3, CE3, CG5, CG6 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 CG3, CE3, CG5, CG6 and CT3 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 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 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 or in person at the beginning or end of a lecture.

Assessment

	Description	Qualification	Training and Learning Results	
Essay questions exam	Solving of questions related to the theoretical concepts of the topics in both the classroom and laboratory syllabi.	30	B3 B5 B6	
Problem and/or exercise solving	(Problem 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.	52	B3 B5 B6	C3
Report of practices, practicum and external practices	Execution of real and simulated measurements. Real- and simulated-measurement result processing.	18	B3 B5 B6	D3

Other comments on the Evaluation

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

Following the particular guidelines of this degree, the students taking this subject will be offered two alternative assessment systems: continuous assessment and single assessment.

It will be assumed that a student chooses continuous assessment if he or she takes and hands the third assessment exercise in (see §1.1) and that he or she chooses single assessment if he or she does not hand the aforementioned exercise in. Once the results of this exercise are handed in, it will be understood that the student has taken the current term's examination call and he or she will be qualified in the first assessment chance of the regular call according to the criteria that are detailed in §2.1, regardless of whether he or she takes the End of Semester Examination or not.

Proper ethical behaviour is requested from the students. In the event that the lecturers in charge of the assessment notice unethical behaviour (cheating, plagiarism, introduction or use of means not permitted by the rules and instructions for the assessment exercises and tests, etc.), the student will be regarded as not meeting the necessary requirements to pass the

subject. In this case, the student will be assigned an overall grade of 0 (zero points) for the current academic year and the fact will be communicated to the head of the Centre to take appropriate measures.

1. ASSESSMENT TESTS

1.1. CONTINUOUS ASSESSMENT INTERMEDIATE EXERCISES

The schedule of the exercises will be approved in a "Comisión Académica de Grado" (CAG) and made available by the beginning of each semester. These exercises are not retakeable, i.e., they can be only taken in the scheduled dates. The examinations (§1.2) allow recovering part of the lost marks up to reach the maximum overall grade (see §2.1).

As a general rule, the marks of each exercise will be published before the next one. The marked exercises may be revised, during the tutorial-aid hours of the corresponding lecturer , along the fourteen days following the publication date of the marks.

The marks obtained in the exercises will be only valid for the two assessment chances of the regular call (see §2.1) of the academic term the exercises have been taken.

Three exercises will be scheduled:

LC1 and LC2) Experimental laboratory exercises comprising the execution of actual measurements and the processing of the results, consisting in taking an experimental laboratory class, individually processing (during the last 30 minutes) the assessable results which will be specified in the corresponding experiments guide and handing them in at the end of the class (marks LC1 and LC2 between 0 and 1 point for each of the exercises).

TC) Combined individual test with questions and exercises. Questions about theoretical concepts and solving of elementary cases and situations related to the topics in the classroom syllabus (mark TC between 0 and 1 point). Length: 30 minutes during one of the theory or problem-solving lectures.

The exercises not taken by the student will be marked with 0 (zero points).

1.2. EXAMINATIONS

Combined individual tests with:

Tx) Questions and exercises, (mark Tx between 0 and 5 points distributed among them).

Px) Solving of one or two problems, (mark Px between 0 and 3,4 points distributed between them).

Lx) Solving of a laboratory problem comprising the execution of real or simulated measurements and the processing of the results (mark Lx between 0 and 1,6 points).

The parts of the examination that the student does not hand in will be marked with 0 (zero points).

Length: 2 hours in each of the dates officially assigned for the subject in the examinations schedule of the Centre.

1.2.1. Regular examinations

- First assessment chance: End-of-Semester Examination x = F (marks TF, PF, LF)

- Second assessment chance: Resit Examination x = R (marks TR, PR, LR)

1.2.2. Special examination

- End-of-studies call: End-of-Studies Examination x = E (marks TE, PE, LE)

2. REGULAR ASSESSMENT CALL GRADING

2.1. CONTINUOUS ASSESSMENT option

2.1.1. Combined experimental laboratory mark (LLx)

For each of the assessment chances the combined experimental laboratory mark will be calculated as the sum of marks LC1 and LC2 from continuous assessment (§1.1) and mark Lx from the corresponding examination. If this sum results greater than 2 (two points) its value will be truncated to 2 (two points).

$LLx = \min \{LC1 + LC2 + Lx , 2\}$

2.1.2. Overall grade

For each of the assessment chances the overall grade will be calculated as the sum of the marks of:

Tx) The questions and exercises part of the corresponding examination (§1.2.1).

TC) The questions and exercises continuous assessment test (§1.1).

Px) The problem solving part of the corresponding examination (§1.2.1).

LLx) The corresponding combined experimental laboratory mark (§2.1.1).

If this sum results greater than 10 (ten points) its value will be truncated to 10 (ten points).

OVERALL_x = min {Tx + TC + Px + LLx , 10}

2.2. SINGLE ASSESSMENT option

For each of the assessment chances the overall grade will be calculated as the sum of the marks of the corresponding examination (§1.2.1).

OVERALL_x = Tx + Px + Lx

3. SPECIAL END-OF-STUDIES CALL GRADING

The overall grade will be calculated as the sum of the marks of the End-of-Studies Examination (§1.2.2).

OVERALL_E = TE + PE + LE

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 overall grade 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 grading scale is established on the understanding that the minimum overall grade necessary to pass the subject is 5,0 points.

Sources of information

Basic Bibliography

H.D. Young y R.A. Freedman, **Sears-Zemansky. Física Universitaria**, 9, 11, 12 o 13, Addison-Wesley,

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Profesorado presente y pasado de la asignatura., **Guiones de las prácticas de «Física Fundamentos de Mecánica y Termodinámica»**, 2021-2022, 2021

Present and past lecturers of this subject, **Laboratory Notes for**, 2021-2022, 2021

Oficina Internacional de Pesas y Medidas (BIPM), **Sistema Internacional de Unidades SI**, 9, Centro Español de Metrología, 2019

Bureau Internationale des Poids et Mesures (BIPM), **SI Brochure: The International System of Units (SI)**, 9, Bureau Internationale des Poids et Mesures (BIPM), 2019

Complementary Bibliography

I.N. Bronshtein, K.A. Semendiaev, **Manual de Matemáticas para Ingenieros y Estudiantes**, (cualquier edición), MIR,

Raymond A. Serway, John W. Jewett, **Física, Tomo 1**, 3, Thomson, 2003

Paul A. Tipler, **Física, Tomo 1**, 5, Reverté, 2005

W. Edward Gettys, et al., **Física Clásica y Moderna**, Mc Graw-Hill, 1991

Douglas C. Giancoli, **Física para universitarios, Tomo 1**, 3, Prentice-Hall, 2002

Marcelo Alonso, Edward J. Finn, **Física**, Addison-Wesley, 1995

Susan M. Lea, John R. Burke, **Física. La naturaleza de las cosas, Tomo 1**, Paraninfo, 2001

Ambler Thompson, Barry N. Taylor, **NIST Special Publication 811, «Guide for the Use of the International System of Units (SI)»**, 2008, National Institute of Standards and Technology, 2008

Comité Conjunto para las Guías en Metrología (JCGM), **Vocabulario Internacional de Metrología VIM**, 3, Centro Español de Metrología, 2012

Recommendations

Subjects that are recommended to be taken simultaneously

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

Other comments

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

Contingency plan

Description

* Teaching methodologies modified

"Laboratory practical": During the practical session:
-Execution of the experiment.
The experiments (either regular or for continuous assessment) will be reformulated so that they can be carried out physically with domestic elements, by simulation, or they will be converted into classroom experiments and the resulting measurements will be provided to the students.

IDENTIFYING DATA				
Business: Company Fundamentals				
Subject	Business: Company Fundamentals			
Code	V05G306V01104			
Study programme	Degree in Telecommunication Technologies Engineering-English teaching			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Basic education	1st	1st
Teaching language	English			
Department				
Coordinator	Fernández Arias, María Jesús			
Lecturers	Fernández Arias, María Jesús			
E-mail	jarias@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.			

Skills	
Code	
B4	CG4: The ability to solve problems with initiative, to make creative decisions and to communicate and transmit knowledge and skills, understanding the ethical and professional responsibility of the Technical Telecommunication Engineer activity.
B8	CG8: To know and apply basic elements of economics and human resources management, project organization and planning, as well as the legislation, regulation and standarization in Telecommunications.
C5	CE5/FB5: The necessary knowledge of business concepts, of law and institutional frameworks. business organization and management .
D2	CT2 Understanding Engineering within a framework of sustainable development.

Learning outcomes			
Expected results from this subject	Training and Learning Results		
To propose improvement solutions and to control the start-up.			D2
To establish guidelines on the metrics and indicators that will be used to allow the managers of the company the evaluation and monitoring of computer systems	B4 B8	C5	D2
To manage the requirements and products of the team to reduce the time of completion of projects, improve consistency and accuracy in the business environment.	B8		

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. Assets, Liabilities and Net Equity 2.2. Working capital analysis 2.3. Operating cycle and cash conversion cycle
Unit 3: THE RESULTS OF THE COMPANY	3.1. The results of the company 3.2. Profitability 3.3. Solvency and liquidity
UNIT 4: THE INVERSION IN THE COMPANY	4.1. Concept of investment 4.2. Classes of investments 4.3. Criteria for the evaluation and selection of investments: static and dynamic

UNIT 5: FINANCIAL OF THE COMPANY	5.1. Concept of source of finance 5.2. Types of sources of finance 5.3. External finance in the short term 5.4. External finance on a long-term basis 5.5. Internal finance
UNIT 6: OPERATION MANAGEMENT (PART I). GENERAL FEATURES	6.1. Research, development and technological innovation. 6.2. Functions of Operations Management. 6.3. Classification of productive processes. 6.4. The economic programming of the production. 6.5. The productivity: indicators of productivity.
UNIT 7: OPERATION MANAGEMENT (PART II).	7.1. The costs of production. 7.2. Break-even point. 7.3. Make-or-Buy decisions. 7.4. Operational leverage. 7.5. Inventory control.
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 1: Typology and nature of the firm Practical classes 2: ICT´s environment Practical classes 3: Analysis of the economic and financial structure of the company I Practical classes 4: Analysis of the economic and financial structure of the company II Practical classes 5: Analysis of the economic and financial structure of the company III Practical classes 6: Analysis of the results of the company Practical classes 7: Investment Decisions I Practical classes 8: Investment Decisions II. Practical classes 9: Financing I Practical classes 10: Financing II Practical classes 11: Productivity Practical classes 12: Production costs Practical classes 13: Production Practical classes 14: Business plan

Planning			
	Class hours	Hours outside the classroom	Total hours
Lecturing	28	56	84
Practices through ICT	24	36	60
Case studies	2	2	4
Objective questions exam	1	0	1
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
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 competencies CG8, CE5, CT2 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 activities are focused on developing the CG4 and CE5 competences in a practical way.
Case studies	Methodology of qualitative analysis in which the student studies a specific case, deepening, exploring, and qualifying various contents of the subject. With this methodology, the competences CG8, CE5, CT2 are worked on.

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 opportunity to attend the personalized tutorials in the professor's office at the time established by professors for this purpose at the beginning of the course and which will be published on the web page of the subject. 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.
Case studies	In the case study the teacher will attend and guide in the doubts that may arise to students about the case raised.
Practices through ICT	In the practical sessions the professor will attend and orient about the doubts that could arise to the students on the contents of the exercises or problems raised.

Assessment

	Description	Qualification	Training and Learning Results		
Objective questions exam	Tests that will be carried out throughout the course, both in theory classes and practices, distributed in a uniform and scheduled way so that they do not interfere in the rest of the subjects	40	B4 B8	C5	D2
Essay questions exam	Final test that may contain partially or totally the contents of the subject developed in theory and practical classes.	60	B4 B8	C5	D2

Other comments on the Evaluation

Following the guidelines established in the degree, two evaluation systems will be offered: continuous assessment (with two options) and one unique evaluation exam at the end of the semester. In any of the two evaluation systems, all the competences of the subject are evaluated.

1. Continuous assessment

The continuous assessment will consist of two intermediate tests developed throughout the semester, and which will be completed with an exam at the end of the semester. The dates to take the two intermediate tests will be planned by the Academic Committee of Degree and will be available at the beginning of the semester. These tests do not release material, but each one of them will deal with the contents studied up to the time of the test, both in theory classes and practices, which is why the last test will be given a greater weight in the calculation of the qualification with respect to the previous one, so that the first test weighs 40%, and the second test 60%.

If the students have passed the last intermediate test , and obtained a weighted average with a grade of 5, they will be exempt from taking the exam at the end of the semester. The grade obtained by the student in this case will be the weighted average grade of the two tests.

Students who do not pass the subject through the two intermediate tests, will have to complete the continuous assessment by taking an exam at the end of the semester that will consist of a test that will represent 60% of the grade that will be added to the grade obtained in the continuous evaluation (40% of the weighted average of the intermediate tests).

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.

2. Students who do NO opt by Continuous evaluation

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 second opportunity

The students must choose, and communicate in writing (one week before the exam), that they wish to be evaluated again, in its entirety, up to the maximum possible grade or follow the continuous evaluation procedure stipulated in the subject, maintaining the grade obtained in the previous assignments .

By default, the students save the results of the tests carried out in this course.

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 extraordinary opportunity at the end of the academic year

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

Important notice

In the case of detection of copy in any of the tests, the final qualification will be Fail (0), and the fact will be communicated to the Governing Board of the Faculty.

Sources of information

Basic Bibliography

Pérez Gorostegui, E., **Curso de introducción a la economía de la empresa**, 9788480049016, EDITORIAL UNIVERSITARIA RAMON ARECES, 2009

Diez-Viel, I., Martin de Castro, G., Montoro Sanchez, M.A., **Introduction to Business Administration**, 9788447040650, S.L. CIVITAS EDICIONES, 2012

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Barroso Castro, C. (Coord.), **Economía de la empresa**, 9788436827194, Pirámide, 2012

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García Márquez, F., **Dirección y Gestión Empresarial**, 978-8448190385, 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**, 978-8483227527, Grupo Anaya, 2011

Recommendations

Contingency plan

Description

=== EXCEPTIONAL PLANNING ===

=== ADAPTATION OF THE METHODOLOGIES ===

In the case that teaching is exclusively non-face-to-face, additional documentation may be added to facilitate self-learning; as well as the use of virtual classes.

=== ADAPTATION OF THE EVALUATION ===

In the event that the pending evaluation tests must be carried out online, the second intermediate test of the continuous evaluation will be divided into two tests with a weight of 30% each.

Likewise, the possibility of passing the subject continues without having to complete the continuous assessment with the exam at the end of the semester. To do this, they must pass the third intermediate continuous assessment test and that the weighted average of the three intermediate tests is at least 5.

IDENTIFYING DATA				
Programming I				
Subject	Programming I			
Code	V05G306V01105			
Study programme	Degree in Telecommunication Technologies Engineering-English teaching			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Mandatory	1st	1st
Teaching language	English			
Department				
Coordinator	Rodríguez Hernández, Pedro Salvador			
Lecturers	López Escobar, Juan José Rodríguez Hernández, Pedro Salvador			
E-mail	pedro.rodriguez@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) materials and bibliographic references in English, b) tutoring sessions in English, c) exams and assessments in English.			

Skills	
Code	
B4	CG4: The ability to solve problems with initiative, to make creative decisions and to communicate and transmit knowledge and skills, understanding the ethical and professional responsibility of the Technical Telecommunication Engineer activity.
B9	CG9: The ability to work in multidisciplinary groups in a Multilanguage environment and to communicate, in writing and orally, knowledge, procedures, results and ideas related with Telecommunications and Electronics.
C6	CE6/T1: The ability to learn independently new knowledge and appropriate techniques for the conception, development and exploitation of telecommunication systems and services
C12	CE12/T7: The knowledge and use of basics in telecommunication networks, systems and service programming.
D2	CT2 Understanding Engineering within a framework of sustainable development.
D4	CT4 Encourage cooperative work, and skills like communication, organization, planning and acceptance of responsibility in a multilingual and multidisciplinary work environment, which promotes education for equality, peace and respect for fundamental rights.

Learning outcomes			
Expected results from this subject	Training and Learning Results		
Express the solution of a simple problem by means of algorithms using top-down design.		C12	
Identify the data needed to solve a problem and associate them with appropriate datatypes based on their features (size, range, associated operators)		C12	
Code simple algorithms using the basic types of statements: assignment, selection and iteration.		C12	
Declare and define functions with a proper use of parameters.		C12	
Handle I/O operations and file management.		C12	
Define and use structured data types.		C12	
Define and manage dynamic data structures (lists, stacks, queues and trees).		C12	
Create modules and library functions and use them in programs.		C6 C12	
Predict the result of a sequence of statements, knowing the input data.		C12	
Handle basic tools in an integrated development environment: text editor, compiler, linker, debugger and documentation tools.		C6	
Develop a small scale project following all the phases: requirements analysis, design, implementation, testing and documentation.	B4 B9	C6 C12	D2 D4

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 statements
Lecture 4: Arrays and pointers	1. Data Structures 2. Arrays: (a) One-dimensional arrays (b) Two-dimensional arrays 3. Strings 4. Pointers: (a) Pointer arithmetic (b) Arrays and pointers (c) Pointers to pointers
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 5. Functions with parameters by reference 6. Command line arguments
Lecture 6: 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 7: Structured type variables	1. Introduction: Structured data types 2. Structures: (a) Declaration (b) Operations (c) Pointers and structures (d) Structures as parameters
Lecture 8: 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	22	22	44
Laboratory practical	22	22	44
Laboratory practice	5	25	30
Objective questions exam	4	20	24
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 CE12 and CT2 are developed.

Laboratory practical	During the first part of the term the student codifies, compiles and documents simple programs guided by the instructor. In this 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 CG4, CG9, CE6, CE12, CT2, and CT4 are developed.

Personalized assistance

Methodologies	Description
Lecturing	The professors will provide individual attention to the students along the term, solving their doubts and questions. Questions will be answered during the master sessions or during tutorial sessions. The professors will establish timetables for this purpose at the beginning of the term. This schedule will be published on the subject website.
Laboratory practical	The professors will provide individual attention to the students along the term, solving their doubts and questions about the laboratory practises. Questions will be answered during the lab sessions or during tutorial sessions. The professors will establish timetables for this purpose at the beginning of the term. This schedule will be published on the subject website.

Assessment

	Description	Qualification	Training and Learning Results		
Laboratory practice	The student will take 3 midterm practical tests consisting in the development of small programs in the computer. Each of these tests will assess the student's progress with some of the laboratory practices. The final practice test will asses the student's progress with the practices as a whole.	50	B4 B9	C6 C12	D2 D4
Objective questions exam	The student will take 3 midterm theory tests that may consist of: - short answer questions - multiple choice questions These exams will assess individually the student's mastership of the concepts introduced in the master sessions. The final theory exam on the whole contents of the subject will contain this type of questions too.	40	B4	C12	
Problem and/or exercise solving	The final theory exam will have a part consisting of problem and/or exercise solving	10	B4	C12	

Other comments on the Evaluation

FIRST CALL EVALUATION

Along the semester, several midterm exams will take place, specifically the **Midterm Theory Tests** (PT1, PT2, and PT3), and the **Midterm laboratory Tests** (PL1, PL2, and PL3). 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.

It is mandatory to upload the corresponding practices to Moovi before each laboratory test.

The **Final Theory Test** (ETF) and the **Final Practice Test** (EPF) will take place at the end of the semester.

It is mandatory to upload all the practices to Moovi before the final practice test.

The Final Theory Test (ETF) is an exam that may consist of short answer questions and/or multiple-choice questions and problems and/or exercises. It assesses the student□s command of the contents introduced in the lectures.

The Final Practice Test (EPF) assesses the proper coding in C to deal with all the laboratory practices. While the practices development is a group activity, it is assessed individually. Indirectly, the EPF also assesses the student□s command of the contents introduced in the lectures.

Following the guidelines of the degree, students are offered two evaluation type: **continuous assessment** and **exam-only assessment**.

The subscription to perform the second midterm tests, Theory Test 2 (PT2) and / or Laboratory Test 2 (PL2) will be interpreted as the decision to opt for continuous assessment. The non-enrolment in the second midterm tests will be interpreted as the decision to opt for the exam-only assessment.

CONTINUOUS ASSESSMENT

The continuous assessment will be considered as "passed" if the final grade (NFC) obtained by the student is at least 5. This final grade is the weighted geometric mean of the midterm and final tests grades, calculated as follows:

NFC = NPP^0.6 * ETF^0.2 * EPF^0.2

where:

- NPP is the Midterm Tests Grade, calculated as the weighted arithmetic mean of all the midterm tests, according to the following expression:

NPP = (NP1 + 2*NP2 + 3*NP3) / 6

Where NPi is the i-th midterm test grade, calculated as the theory and laboratory grades mean:

NPi = (PTi + PLi) / 2

- ETF is the Final Theory Test grade

- EPF is the Final Practice Test grade

Note that the application of geometric mean implies that it is not possible to pass the subject if any of the notes (NPP, ETF or EPF) is zero.

None of the tests in the continuous assessment type is repeatable; that is, the instructor has no obligation to reschedule an evaluated activity missed by a student.

The date and procedures for the revision of the grades will be known before the evaluation tests. The students will have the chance of reviewing the grades preferably within two weeks after the evaluation.

EXAM-ONLY ASSESSMENT

In order to pass the course by the exam-only assessment type, the final grade obtained by the student (NFU) must be at least 5.

This type will consist of the same final tests as the continuous assessment one (although with different weights), that is, an exam that may consist of short answer questions and/or multiple choice questions and problems and/or exercises (Final Theory Test, ETF) and a practice test that will evaluate the laboratory practices (Final Practice Test, EPF). The final grade by exam-only assessment is the weighted geometric mean of the theory and practice grades, calculated as follows:

NFU = ETF^0.5 * EPF^0.5

Both the continuous assessment grade (NFC) and the exam-only assessment grade (NFU) will be computed to all students that take the final tests (theory and practice). The final grade will be the higher one.

A "No Present" grade will be granted if no test is taken by the students after the first midterm tests (PP1 and PL1).

SECOND CALL EVALUATION

University regulations allow students to take an additional test to pass the course (second call evaluation).

In order to pass the course using this second call evaluation, the final grade obtained by the student (NFS) must be at least

5.

This second call evaluation will consist of an exam that may consist of short answer questions and/or multiple-choice questions and problems and/or exercises (Second Call Theory Test: PTS) and a practice test which will include the evaluation of the laboratory practices (Second Call Practice Test: PPS). The final grade is the weighted geometric mean between the theory and practice grades, calculated as follows:

NFS = NTS^0.5 * NPS^0.5

Where:

- NTS is the Theory Grade by second call Evaluation: if the student takes the Second Call Theory Test, NTS will be the grade obtained in that test:

NTS = PTS

Otherwise, NTS will be the theory grade obtained in his/her first chance evaluation:

NTS = PPT^0.6 * ETF^0.4

Where PPT is the weighted arithmetic mean of the midterm theory tests:

PPT = (PT1 + 2 * PT2 + 3 * PT3) / 6

- NPS is the Practice Grade by second call Evaluation: if the student takes the Second Call Practice Test, NPS will be the grade obtained in that test:

NPS = PPS

It is mandatory to upload all the practices to Moovi before the second call practice test.

Otherwise, NPS will be the practice grade obtained in his/her first chance evaluation:

NPS = PPL^0.6 * EPF^0.4

Where PPL is the weighted arithmetic mean of the midterm laboratory tests:

PPL = (PL1 + 2 * PL2 + 3 * PL3) / 6

END OF PROGRAM CALL EVALUATION

University regulations allow students who have 3 or less subjects left to graduate to take an extra call for these subjects.

In order to pass the course using the end-of-program evaluation system, the final grade obtained by the student (NFG) must be at least 5.

This end-of-program evaluation will consist of an exam that may consist of short answer questions and/or multiple-choice questions and problems and/or exercises (End-of-program Theory Test: ETG) and a practice test which will include the evaluation of the laboratory practices (End-of-program Practice Test: EPG). The final grade is the weighted geometric mean of the theory and practice grades, calculated as follows:

NFG = ETG^0.5 * EPG^0.5

All the midterm and final grades will only be valid for the term the student is enrolled to, that is, in case the student repeats the subject, he or she will not retain any of the grades of the previous year.

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

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Sources of information

Basic Bibliography

Brian W. Kernighan, Dennis M. Ritchie, **The C Programming Language**, 1995, Prentice Hall, 1983
Brian W. Kernighan, Dennis M. Ritchie, **El Lenguaje de Programación C**, 1995, Prentice Hall, 1983
Manuel Caeiro Rodríguez, Enrique Costa Montenegro, Ubaldo García Palomares, Cristina López Bravo, J, **Practicar Programación en C**, 2014,

Complementary Bibliography

Ignacio Alvarado Aldea, Jose María Maestre Torreblanca, Carlos Vivas Venegas, Ascensión Zafra Cabeza, **100 Problemas Resueltos de Programación en Lenguaje C para Ingeniería**, 2017, Paraninfo, 2017
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Stephen G. Kochan, **Programming in C**, 2014, Addison Wesley, 2005
Osvaldo Cairo Battistuti, **Fundamentos de Programación**, 2006, Pearson Education,
José Rafael García-Bermejo Giner, **Programación Estructurada en C**, 2008, Prentice Hall,
James L. Antonakos, Kenneth C. Mansfield Jr., **Programación Estructurada en C**, 2004, Prentice Hall, 1997
Jorge A. Villalobos S., Rubby Casallas G., **Fundamentos de Programación: Aprendizaje Activo Basado en Casos**, 2006, Prentice Hall,

Recommendations

Subjects that continue the syllabus

Informatics: Computer Architecture/V05G301V01109
Programming II/V05G301V01110

Other comments

Programming II course continues this course in the second semester of the first year.

Contingency plan

Description

In case of online tuition, the methodologies used and the tests performed will be the same as in the case of in-person tuition.

The only expected modification is that they will be carried out via Remote Camnpus and Moovi, instead of the School classrooms and laboratories.

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

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

Learning outcomes			
Expected results from this subject	Training and Learning Results		
Managing the transformation of Laplace as a tool of analysis of the linear systems.	B3 B4	C1	D2 D3
Knowledge of the necessary theoretical bases for the analysis of Fourier.	B3 B4	C1	D2 D3
Knowledge and handle of the simple techniques for the integration of ordinary differential equations.	B3 B4	C1	D2 D3
Understanding the basic theory of integration of functions of one and several variables.	B3 B4	C1	D2 D3

Contents	
Topic	
Subject 1. Integral calculus in R.	The Riemann integral: integrable functions. Fundamental theorems of the integral calculus. Computation of primitives: integration by parts and change of variable. Improper integrals.

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

Planning

	Class hours	Hours outside the classroom	Total hours
Problem solving	19	19	38
Laboratory practical	3	6	9
Lecturing	28	56	84
Problem and/or exercise solving	5	10	15
Laboratory practice	1	3	4

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

Methodologies

	Description
Problem solving	In these hours of work the professor will solve problems of each one of the subjects and will enter new methods of solution no contained in the master classes from a practical point of view. The student also will have to solve problems proposed by the professor with the aim to apply the obtained knowledges. Through this methodology the competencies CG3, CG4, CE1, CT2 e CT3 are developed.
Laboratory practical	In these practices, the computer tools MATLAB or MAXIMA will be used to study and to apply the numerical methods of approximation of integrals described in the Theme 2 of the matter. Through this methodology the competencies CG4, CE1, CT2 e CT3 are developed.
Lecturing	The professor will expose in this type of classes the theoretical contents of the matter. Through this methodology the competencies CG3, CE1, CT2 e CT3 are developed.

Personalized assistance

Methodologies	Description
Lecturing	The professor will attend personally the doubts and queries of the students. He will solve doubts in his office, in the classes of problems, and in the laboratory. Also the Web platform Moovi and the email will be used to help the students. They will have occasion of to attend tutorial sessions in a timetable established at the beginning of the course and which will be published in Moovi.
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.
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.

Assessment

	Description	Qualification	Training and Learning Results	
Problem and/or exercise solving	Three "one hour sessions": 1st session: Themes 1 and 3. 2nd session: Theme 4. 3rd session: Themes 5 and 6. These three sessions account for 45% of the score with the following weights: First: 15% (1,5 points) Second: 15% (1,5 points) Third: 15% (1,5 points) Final exam: 50% (5 points) Individual assessment	95	B3 B4	C1
Laboratory practice	The students will do a practice of laboratory of the Theme 2 using MATLAB or MAXIMA. Its value will be of 5% (0,5 points) Individual assessment	5		C1

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 four sessions of the items 1, 2, 3, 4, 5 and 6.
E: Grade of the final examination of the items 4, 5 and 6.

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

2. Exam-only 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. Second call.

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

NR = C + ER

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

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

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

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

4. Qualification of not presented.

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

5. End-of-program call.

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

Sources of information

Basic Bibliography

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

Complementary Bibliography

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

Recommendations

Subjects that continue the syllabus

Physics: Fields and Waves/V05G301V01202

Subjects that are recommended to be taken simultaneously

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

Subjects that it is recommended to have taken before

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

Contingency plan

Description

In the case of non-presential teaching, the lectures will be imparted by means of Campus Remoto and Moovi.
In this case, the assessments of evaluation will be made by means of Moovi and the virtual classrooms in Campus Remoto.
Likewise, the tutorial sessions will carry out through the virtual offices of the professors in Campus Remoto and/or the email.

IDENTIFYING DATA				
Mathematics: Probability and Statistics				
Subject	Mathematics: Probability and Statistics			
Code	V05G306V01107			
Study programme	Degree in Telecommunication Technologies Engineering-English teaching			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Basic education	1st	2nd
Teaching language	English			
Department				
Coordinator	Fernández Bernárdez, José Ramón Alonso Alonso, Ignacio			
Lecturers	Alonso Alonso, Ignacio Fernández Bernárdez, José Ramón			
E-mail	ignacio.alonso@uvigo.es 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.			

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

Learning outcomes			
Expected results from this subject	Training and Learning Results		
Learn how to distinguish between deterministic or random models	B4	C1	D2
Identify a probabilistic model that fits with the needs of a specific problem	B3 B4	C1	D2 D3
Propose solutions to simplify statistical models by using deterministic parameters	B3 B4	C1	D2 D3

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 varriables: 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	24	24	48
Problem solving	13.5	28	41.5
Practices through ICT	14	7	21
Problem and/or exercise solving	2	7	9
Objective questions exam	0.5	2	2.5
Essay questions exam	2	26	28
*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 CG3, CE1 and CT3 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 CG3, CG4, CE1, CT2 and CT3 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 CG3, CG4, CE1, CT2 and CT3 are developed.

Personalized assistance

Methodologies	Description
Lecturing	Students will have the opportunity to attend personalized tutorials at specific times established for this purpose at the beginning of the course. This schedule will be published on the subject's website. Tutorials may also be carried out online by appointment.
Problem solving	Students will have the opportunity to attend personalized tutorials at specific times established for this purpose at the beginning of the course. This schedule will be published on the subject's website. Tutorials may also be carried out online by appointment.
Practices through ICT	Students will have the opportunity to attend personalized tutorials at specific times established for this purpose at the beginning of the course. This schedule will be published on the subject's website. Tutorials may also be carried out online by appointment.

Assessment

	Description	Qualification	Training and Learning Results	
Problem and/or exercise solving	Students must solve a problem individually, three occasions along the course	37.5	B3 B4	C1
Objective questions exam	Students must answer a multiple choice test individually.	12.5	B3 B4	C1

Essay questions exam	Individual final exam.	50	B3 B4	C1

Other comments on the Evaluation

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

Continuous assessment is based on several tasks. 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.

Students who choose Continuous assessment:

Several tasks are evaluated with a grade between 0 and 10. The schedule of the midterm/intermediate exams 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 12.5%. 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 12.5%

Task 3: Individual resolution of a problem. Weight 12.5%

Task 4: Individual resolution of a problem. Weight 12.5%

Last Task: Final exam. A reduced version of the exam to be carried out by the students who choose Final exam assessment. Weight 50%

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.

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

If a student has participated in 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.

The final grade for students who choose Continuous assessment will be calculated as the mean between the final exam and the average of the previous tasks marks. To minimize the impact of a possible miss on a task, the average of these will be computed excluding the worst grade.

Students who choose Final exam assessment or End-of-program call:

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

Second call

At the Second call, available only for students who have not passed the subject previously, students have to choose between Continuous and Final exam assessment, regardless of the system they chose at the First call. 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**, 11 ed, 2021

JR Fernández, I. Alonso and A. Mojón, **Notes on Probability and Statistics**, 1 ed, 2021
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**, 9780849304330, 1 ed, CRC Press, 1999
R. Cao y otros, **Introducción a la estadística y sus aplicaciones**, 9788436815436, 1 ed, Pirámide, 2001

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H. Stark y J.W. Woods, **Probability, Random Processes, and estimation theory for engineers**, 9780137287918, 2 ed, Prentice Hall, 1994
D. Peña, **Estadística, modelos y métodos. Tomo 1: Fundamentos**, 9788420681092, 2 ed, Alianza Universidad Textos, 1991
P. Peebles, **Principios de probabilidad, variables aleatorias y señales aleatorias**, 9788448149017, 4 ed, McGraw-Hill, 2006
A. Papoulis, **Probability, random variables and stochastic processes**, 9780071226615, 4 ed, McGraw-Hill, 2002
A. Blasco y S. Pérez-Díaz, **Modelos aleatorios en ingeniería**, 9788428337236, 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

Mathematics: Calculus 2/V05G301V01106

Subjects that it is recommended to have taken before

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

Contingency plan

Description

If teaching were not face-to-face, the planning will be maintained, both for groups A and groups B, but virtual teaching would be used.

In addition to the virtual classes and to facilitate student learning and autonomous work, they will have all the theoretical content of the subject recorded in short videos (in Spanish), as well as all the slides or any other material employed for the lectures and the possibility of online tutoring.

Regarding the assessment, if it is not possible to carry out the exams in-person, the following modifications would be made:

- All the continuous assessment tests would be maintained, except for Part 2 of Task 1, which would be eliminated. In this case, what has been described as Part 1 of Task 1 would have all the weight expected for the whole task.

- The final exam would be the same for all students, that is, those who chose continuous assessment would not take a reduced version of it.

- As long as the four previous planned tasks could have been carried out, the average of these will be calculated excluding the worst of the grades. Otherwise, it will be calculated with all the available task grades.

- The final grade of the students who chose continuous assessment will be calculated as the highest between the final exam grade and the average between the final exam grade and the average grade of the previous tasks.

The rest of the conditions of the assessment system will not be modified.

IDENTIFYING DATA				
Physics: Analysis of Linear Circuits				
Subject	Physics: Analysis of Linear Circuits			
Code	V05G306V01108			
Study programme	Degree in Telecommunication Technologies Engineering-English teaching			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Basic education	1st	2nd
Teaching language	#EnglishFriendly Spanish			
Department				
Coordinator	García Mateo, Carmen García-Tuñón Blanca, Inés			
Lecturers	García Mateo, Carmen García-Tuñón Blanca, Inés			
E-mail	inesgt@com.uvigo.es carmen.garcia@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).			

Skills	
Code	
B3	CG3: The knowledge of basic subjects and technologies that enables the student to learn new methods and technologies, as well as to give him great versatility to confront and adapt to new situations
B4	CG4: The ability to solve problems with initiative, to make creative decisions and to communicate and transmit knowledge and skills, understanding the ethical and professional responsibility of the Technical Telecommunication Engineer activity.
C4	CE4/FB4: Comprehension and command of basic concepts in linear systems and their related functions and transforms; electric circuits theory, electronic circuits, physical principles of semiconductors and logical families, electronic and photonic devices, materials technology and their application to solve Engineering problems.
D2	CT2 Understanding Engineering within a framework of sustainable development.
D3	CT3 Awareness of the need for long-life training and continuous quality improvement, showing a flexible, open and ethical attitude toward different opinions and situations, particularly on non-discrimination based on sex, race or religion, as well as respect for fundamental rights, accessibility, etc.

Learning outcomes			
Expected results from this subject	Training and Learning Results		
To know the elements and laws involved in lumped circuit analysis.		C4	
To show the ability to analyse linear circuits in different circumstances: -. to know how to choose among different alternatives when solving a problem. -. to know simplifying techniques, their constraints, and how to decide which ones must be used.	B4	C4	D2
To translate the time domain into the transformed domains, by using transforms basic concepts.		C4	
To be able to qualitatively justify the role played by circuit elements and their interactions.	B3	C4	D3
To master the language and symbolism of the discipline	B3	C4	D3

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: Two-port circuits	Definition of a two-port circuit. Characteristic parameters. Interconnected two-port circuits. Analysis of the terminated two-port circuit.
VI: Circuit analysis in the transformed domain	Steady-state response in a circuit. The transfer function. Circuit elements in the s domain. Circuit analysis in the s domain.
VII: Frequency selective circuits	Filter concept. Low-pass filters. High-pass filters. Bandpass filters. Bandreject filters.
VIII: Circuit analysis in the time domain	Classification of signals. Classification of systems. Linear and time invariant systems. Direct and inverse Laplace Transform. Poles and zeros diagram. Response to impulse. Convolution integral.

Planning			
	Class hours	Hours outside the classroom	Total hours
Introductory activities	0.5	0	0.5
Lecturing	24.5	49	73.5
Practices through ICT	22	22	44
Laboratory practical	3	3	6
Problem and/or exercise solving	3	9	12
Laboratory practice	1	3	4
Essay questions exam	2	8	10
*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	Theses 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	Two practical sessions will be carried out in the hardware lab, assembling and measuring circuits tasks will be covered. Out of the total of 4 hours, 1 hour will be dedicated to the evaluation of these sessions. 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.
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, 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, professors address the needs and queries of the students related to practices in computer rooms.

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 1.5 points. The schedule of the tests will be approved in the CAG and will be available at the beginning of the semester.	45	B3 C4 B4
Laboratory practice	This test (ECHW) is done during Group B hours in the hardware laboratory. The specific day will be approved by the academic board (CAG) and will be available at the beginning of the semester. It is a test related to assembly and measurement of circuits, and will have a maximum score of 0.5 points. In these exercises the ability to work in groups, the adjustment to the design specifications and the presentation of results will be evaluated. In order to pass the subject by continuous evaluation, attendance at the two lab sessions (hardware) and its corresponding one is mandatory.	5	B3 C4 D2 B4 D3
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 5 points, and another extended version of it with a score of 10 points for the rest of the students.	50	B3 C4 B4

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. First opportunity 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:

Mark = ECA1 + ECA2 + ECA3 + ECHW + PG

2. Second chance.

Students who did not pass the course at the end of the semester can take an extraordinary final 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.
- Attendance at the two hardware laboratory sessions, and the corresponding ECHW evaluation, is mandatory.
- 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.

Sources of information

Basic Bibliography

James W. Nilsson, **Electric Circuits**, 0133760030, 10, PEARSON, 2014

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

Complementary Bibliography

J.H. McClellan, R.W. Schafer, M.A. Yoder, **Signal Processing First**, 0131202650, PEARSON, 2003

Recommendations

Subjects that continue the syllabus

Physics: Fundamentals of electronics/V05G301V01201
Digital Signal Processing/V05G301V01205
Signal Transmission and Reception Techniques/V05G301V01208

Subjects that are recommended to be taken simultaneously

Mathematics: Calculus 2/V05G301V01106

Subjects that it is recommended to have taken before

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.

Contingency plan

Description

=== ADAPTATION OF THE METHODOLOGIES ===

* Teaching methodologies maintained

The introductory activities, master classes and practices described in the methodologies section will be kept with the support of ICT.

* Teaching methodologies modified

The hardware laboratory practices, in the event that they cannot be carried out in-person class, will be replaced by activities that will be performed virtually.

* Non-attendance mechanisms for student attention (tutoring)

Tutoring sessions may be carried out online: either asynchronously (e-mail, MOOVI forums, etc.) or by videoconference, in this case by appointment.

* Modifications (if applicable) of the contents

There is no need to modify the content to be taught.

* Additional bibliography to facilitate self-learning

Instructional materials and autonomous work proposals will be made available to students. Specific sessions will be organized to help to students for resolve the proposed tasks.

=== ADAPTATION OF THE TESTS ===

* Tests already carried out

Tests already carried out in person will keep their weight unchanged.

* Pending tests that are maintained

Pending type A (ECA) and type B (ECB) tests will be maintained. They may be grouped, if necessary, for organizational and coordination reasons

* Tests that are modified

The test foreseen in the practical laboratory session will be replaced by activities that will be proposed to the students to be carried out virtually.

IDENTIFYING DATA				
Informatics: Computer Architecture				
Subject	Informatics: Computer Architecture			
Code	V05G306V01109			
Study programme	Degree in Telecommunication Technologies Engineering-English teaching			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Basic education	1st	2nd
Teaching language	English			
Department				
Coordinator	Llamas Nistal, Martín Fernández Iglesias, Manuel José			
Lecturers	Fernández Iglesias, Manuel José Liz Domínguez, Martín Llamas Nistal, Martín			
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.			

Skills	
Code	
B3	CG3: The knowledge of basic subjects and technologies that enables the student to learn new methods and technologies, as well as to give him great versatility to confront and adapt to new situations
B4	CG4: The ability to solve problems with initiative, to make creative decisions and to communicate and transmit knowledge and skills, understanding the ethical and professional responsibility of the Technical Telecommunication Engineer activity.
C2	CE2/FB2: The basic knowledge about using and programming computers, operative systems, databases and Engineering applied software.
D2	CT2 Understanding Engineering within a framework of sustainable development.
D3	CT3 Awareness of the need for long-life training and continuous quality improvement, showing a flexible, open and ethical attitude toward different opinions and situations, particularly on non-discrimination based on sex, race or religion, as well as respect for fundamental rights, accessibility, etc.

Learning outcomes			
Expected results from this subject	Training and Learning Results		
Knowledges of the main concepts related with the architecture of the computers and capacity for his handle through models.	B3		
Capacity for the handle of the systems of representation of the information used in the computers	B3		
Knowledges of the types of instructions more representative and variations more notable and capacity to determine the implications of his use by part of the programmer of conventional machine	B3 B4		
Knowledges of the main ways of addressing modes in assembler language and capacity for the efficient handling of these.	B3 B4	C2	
Acquisition of skills on the design of algorithms and the construction of programs to level of conventional machine	B3 B4	C2	D2 D3
Knowledge of the principles and fundamental components of the operating systems	B3	C2	D3

Understanding of the main functions of the operating systems	B3	C2	D3
Knowledge of the fundamental aspects of the databases.	B3	C2	D3
Understanding of the distinct models of organisation of the information in databases	B3	C2	D3
Acquisition of basic skills on the languages of query to databases	B3 B4	C2	D2 D3

Contents	
Topic	
1. Preliminaries	Information Representation in computers. von Neumann Model. Structural, procesal and functional models.
2. Von Neumann Model	Components of von Neumman machine. Simple Machine. Central Processing Unit, Arithmetic and Logic Unit, memory, registers, buses. External Communications, busy waiting.
3. Symbolic Representation and Processing .	Representation of basic data elements: integer, character, floating point. Conventions for data storage. Processing operations. Introduction to symbolic processing. Assembler language.
4. Instructions and addressing	Instructions and addressing modes. Software considerations. Registers at the conventional machine level. Register transfer language (RT level). Instruction formats. Addressing modes. Stacks and subprograms. RISC and CISC computers.
5. RISC Computer	Instruction sets & formats. Addressing modes. Assembler. Example programs.
6. CISC Computer	Instruction sets & formats. Addressing modes. Assembler. Example programs.
7. Device Management.	Device types. Management of variety. Models. Secondary memories. Interrupts. Service Rutines. DMA: justification.
8. Parallelism and parallel Architectures	Pipelining. Parallelism and memory access. Associative Memory. Parallel architectures. Vector processors. Multiprocessors.
9. Operating systems	The operating machine. Introduction to operating systems. Definition of an operating system.
10. Databases	Introduction to the database systems. Database types.

Planning			
	Class hours	Hours outside the classroom	Total hours
Laboratory practical	22	27.5	49.5
Introductory activities	5	5	10
Problem solving	10	17.5	27.5
Lecturing	12	24	36
Self-assessment	0	3	3
Laboratory practice	4	8	12
Problem and/or exercise solving	3	9	12
*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 CG3, CG4, CT2, CT3 and CE2 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
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 CG, CT2 and CE2 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 CG3, CT3 and CE2 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	B3 B4	C2	
Laboratory practice	Three exams consisting of practical exercises at the laboratory will be scheduled along the lecturing period.	50	B3 B4	C2	D2 D3
Problem and/or exercise solving	5 - 7 exams consisting of short-answer questions and exercises at the lecture room will be scheduled along the lecturing period.	50	B3 B4	C2	D2 D3

Other comments on the Evaluation

ASSESSMENT

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

- The Harmonic Average of A and B as HA(A,B)=2*A*B/(A+B). If A=B=0 then HA(A,B)=0
- The Arithmetic Average of A and B as AA(A,B)=(A+B)/2

The Grading Average GA(A,B) of A and B as:

If A >= 4 and B >=4 then GA(A,B) = AA(A, B). Otherwise:

- if HA(A,B) > 3 then GA(A,B) = HA(A,B)
- if HA(A,B)

Sources of information

Basic Bibliography

Gregorio Fernández Fernández, **Curso de Ordenadores. Conceptos básicos de arquitectura y sistemas operativos.**, 978-8474023122, 5ª, Fundación Rogelio Segovia para el Desarrollo de l, 2004

Silberschatz, H.F. Horth y S. Sudarshan, **Fundamentos de Bases de Datos.**, 978-8448190335, 6ª, McGraw-Hill Interamericana de España S.L., 2014

Complementary Bibliography

A. S. Tanenbaum, **Organización de Computadoras. Un enfoque estructurado.**, 978-9701703991, 4ª, Pearson Educación, 2000

J.L. Hennessy y D.A. Patterson, **Arquitectura de los Computadores. Un enfoque cuantitativo**, 978-8476159125, McGraw-Hill Interamericana de España S.L., 2010

Martín Llamas Nistal, Fernando A. Mikic Fonte y Manuel J. Fernández Iglesias, **Arquitectura de Ordenadores: Problemas y Cuestiones de Teoría**, 978-8484086635, 1ª, Andavira, 2012

Alberto Gil Solla, **Ejercicios resueltos sobre Fundamentos de los Ordenadores**, 9788484085331, 1ª, Andavira, 2004

Alberto Gil Solla, **Problemas resueltos de programación en ensamblador**, 9788484085485, 1ª, Andavira, 2004

Fernando A. Mikic Fonte y Martín Llamas Nistal, **Arquitectura de Ordenadores: Problemas de Programación en Ensamblador**, 9788484086314, 1ª, Andavira, 2012

C. Costilla Rodríguez, **Introducción a las Bases de Datos Modernas**, 978-8474022544, Fundación Rogelio Segovia para el Desarrollo de la, 2996

V.C. Hamacher, Z.G. Vranesic, S.G. Zaky,, **Organización de Computadoras**, 2ª, McGraw-Hill Interamericana de España S.L., 1996

D. A. Patterson y J.L. Hennessy (Traducido por J.M. Sánchez), **Organización y diseño de Computadores. La interfaz hardware/software**, McGraw-Hill, 1995

Peter Knaggs, **ARM: Assembly Language Programming**, Peter J. Knaggs, 2016

Gregorio Fernández Fernández, **Elementos de Sistemas Operativos, de representación de la información y de procesadores hardware y software**, DIT-UPM, 2015

Sergio Barrachina Mir, Maribel Castillo Cata- lán, Germán Fabregat Llueca, Juan Carlos Fernández Fer, **Introducción a la arquitectura de computadores con QtARMSim y Arduino**, Universitat Jaume I, 2018

Sergio Barrachina Mir, Maribel Castillo Cata- lán, Germán Fabregat Llueca, Juan Carlos Fernández Fer, **Prácticas de inntroducción a la arquitectura de computadores con QtARMSim y Arduino**, Universitat Jaume I, 2014

Recommendations

Contingency plan

Description

In the case of having to switch to online mode, lectures and exams will be replaced by online lectures and online exams.

IDENTIFYING DATA				
Programming II				
Subject	Programming II			
Code	V05G306V01110			
Study programme	Degree in Telecommunication Technologies Engineering-English teaching			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Mandatory	1st	2nd
Teaching language	English			
Department				
Coordinator	Fernández Iglesias, Manuel José Blanco Fernández, Yolanda			
Lecturers	Blanco Fernández, Yolanda Costa Montenegro, Enrique Fernández Iglesias, Manuel José			
E-mail	yolanda@det.uvigo.es manolo@uvigo.es			
Web	http://moovi.uvigo.gal/			
General description	The general aim of this subject is to provide the students with the theoretical foundations and practical competitions to analyse, design, develop and debug computer applications following the Object-Oriented Programming (OOP) paradigm. Programming II is a mainly practical subject where students have to design and develop several programming projects. With the goal of supporting the students during the development of these software projects, firstly a very brief introduction to the discipline of Software Engineering and its relationship with the OOP paradigm will be given, putting the focus on the stages of analysis, design, implementation and debugging. Next, we will analyse in detail the foundations of OOP, highlight the advantages of UML diagrams for the design tasks that the students will have to carry out. 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.			

Skills	
Code	
B6	CG6: The aptitude to manage mandatory specifications, procedures and laws.
B14	CG14 The ability to use software tools to search for information or bibliographical resources.
C50	(CE50/T18)The ability to develop, interpret and debug programs using basic concepts of Object Oriented Programming (OOP): classes and objects, encapsulation, relations among classes and objects, and inheritance.
C51	(CE51/T19) The ability of basic application of phases of analysis, design, implementation and debugging of OOP programs.
C52	(CE52/T20) The ability of manipulation of CASE tools (editors, debuggers).
C53	(CE53/T21) The ability of developing programs considering to the basic principles of software engineering quality taking into account the main existing sources of norms, standards and specifications.

Learning outcomes		
Expected results from this subject	Training and Learning Results	
To know the main UML diagrams for the documentation in the phases of analysis and design of programs according to the OOP.	B6 B14	C52 C53
To develop skills in the process of analysis, design, implementation and debugging of applications according to the OOP, taking into account the main standards and norms of quality.	B6 B14	C51 C53
To acquire maturity in techniques of development and debugging of programs to allow the autonomous learning of new skills and programming languages.	B6	C51 C52 C53
To understand the basic concepts of Object Oriented Programming (OOP).	B14	C50

Contents
Topic

1. Introduction to the object oriented paradigm	a. Brief introduction to the subject and its organization. b. Birth of the paradigm c. Foundations: classes and objects d. Concepts of encapsulation, inheritance (generalization), and polymorphism e. Brief introduction to UML
2. Encapsulation	a. Classes, interfaces and packages b. Methods and member variables. Visibility. Scope of resolution c. Constructor method d. Parameter passing: pointers and references e. Pointers to objects
4. Object oriented design	a. Design foundations b. Use of UML diagrams
3. Inheritance	a. Derived classes and types of inheritance b. Abstract Classes c. Multiple Inheritance d. Object class
5. Polymorphism	a. Overloading and overwriting b. Abstract classes and interfaces c. Generic classes
6. Exception handling	a. Exceptions foundations b. Handling of Java exceptions

Planning

	Class hours	Hours outside the classroom	Total hours
Lecturing	25	35	60
Practices through ICT	27	59	86
Essay questions exam	2	0	2
Essay questions exam	1	0	1
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
Lecturing	Classes involving explanation of OOP-related concepts and resolution of practical exercises. Through this methodology the competencies CE50, CE51 and CE53 are developed.
Practices through ICT	The students will resolve the practices proposed by the professor. Solutions and doubts will be guided by the professor in order to identify common errors. Software used: the students will be provided with a Ubuntu virtual machine on which Java 11, emacs, Eclipse and Visual Studio Code will be installed. Through this methodology the competencies CE50, CE51, CE52, CE53, CG6 and CG14 are developed.

Personalized assistance

Methodologies	Description
Lecturing	The professor will help students by answering their doubts about the concepts explained in masterclasses.
Practices through ICT	The professor keeps track the level of understanding of the students, supporting them in particular doubts, design errors and possible improvements in their Java coding solutions.

Assessment

	Description	Qualification	Training and Learning Results	
Practices through ICT	This test consists of a set of practices to be developed using the Java programming language. Students who take the exam-only assessment must deliver the practices at the end of the term. In the case of continuous assessment, the practicals will be delivered throughout the academic year on the dates established by the lecturers.	50	B6 B14	C50 C51 C52 C53

Essay questions exam	Each student will take, individually and without any kind of support material, an exam at the end of the term on the totality of the contents covered in the subject. The maximum grade for this test will be 3 points (out of 5) for students who sit continuous assessment, and 5 points for those students who choose the exam-only assessment.	30	C50 C51 C53
Essay questions exam	Each student will take (individually and without any type of material of support) a test on the date the will be approved by CAG (approximately half of the academic period) on the contents that were explained up to one week before the exam. This test will be carried out only by students who sit continuous assessment, and the maximum grade will be 2 points (out of 5 points).	20	C50 C51 C53
Essay questions exam	Each student will make an exam, where a minor modification on the delivered practices will be requested. The grade will be PASS or FAIL.	0	C50 C51 C53

Other comments on the Evaluation

There are two assessment mechanisms, continuous assessment (CA) and exam-only assessment (EA), which must be chosen by the students considering the following conditions:

- CA includes the tests described in the previous point: two theory exams, design and development of Java practices and practical exam.
- Any student can change at the end of the term the initially-chosen evaluation modality. It is considered that a student chooses AC if he/she takes the second theory exam, and EA if he/she takes the final exam. In either case, the student will not be listed as "not presented".
- The CA tests will only take place on the dates established by the teachers, and cannot be repeated later.
- 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.

Assessment procedure at the first opportunity for students who opt for Continuous Assessment (CA)

- **Theoretical part (50%)**: The grade of this part (5 points) is obtained by adding the corresponding marks to the two theoretical exams (halfway and end-of-academic semester), with maximum marks of be 2 and 3 points, respectively. A minimum grade of 2 points (out of 5) is required. Students who get this minimum mark in first-call can keep it for the second-call.
- **Practical part (50%)**: The grade for this part depends on the qualifications obtained in each of the proposed Java practices (up to 5 points in total) and on the result of the practical exam (pass/fail). The Java practices will be delivered in the deadlines established for this purpose throughout the course. Passing the practical exam and a minimum grade of 2.5 points (out of the 5) are required. In case of fail the grade of the Java practices will be multiplied by 0.25. Students who fail in first-call and fulfill both conditions can keep the grade of the practical part for the second-call.

Assessment procedure at the first opportunity for students who opt for Exam-only Assessment (EA):

- **Theoretical part (50%)**: The grade of this part (5 points) corresponds to an individual exam without any type of supporting material at the end of the academic semester (on the date to be approved by CAG). A minimum grade of 2 points is required. Students who get this minimum mark in first-call can keep it for the second-call.
- **Practical part (50%)**: The grade for this part depends on the marks obtained in each of the proposed Java practices (the same as in CA but delivered at the end of the term, with a maximum global grade of 5 points) and also on the result of the practical exam (pass/fail). Passing the computer exam and a minimum grade of 2.5 points (out of 5) is required. In case of fail the grade of the Java practices will be multiplied by 0.25. Students who fail in first-call and fulfill the two aforementioned conditions can keep the grade of the practical part for the second-call.

Assessment procedure in second call and end-of-program call:

The students will be assessed by the mechanism described for EA.

- **Theoretical part (50%)**. Individual exam on the date to be approved by CAG, requiring a minimum grade of 2 points (out of 5).
- **Practical part (50%)**. Java practices (including modifications on the functionalities required in first call, with a maximum grade of 5 points and minimum grade of 2.5 points) and practical exam (pass/fail). In case of fail the grade of the Java practices will be multiplied by 0,25.

Students who failed the subject on a previous call of the academic year can either keep their initial grades (if they are higher than the minimum mark required in the corresponding part) or ask to be re-assessed (in this case, the final grade will be the one obtained on the new call).

Requirements to pass the subject:

- To get at least 2 points in the theoretical part.
- To pass practical exam and to get at least 2.5 points in the development of Java practices.
- To get a final grade (theoretical part + practical part) equal or greater than 5.
- If the final grade is equal or greater than 5 but some of the part does not fulfill the aforementioned minimum, then the final grade will be 4.5 (out of 10 points).

Sources of information

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S. Zakhour, S. Hommel, J. Royal, I. Rabinovitch, T. Risser, M. Hoeber, **The Java Tutorial. A short course on the basics**, 4ª edición, Prentice-Hall, 2006

A. Eberhart, S. Fischer, **Java Tools**, Wiley, 2002

M. Page-Jones, **Fundamentals of object-oriented design in UML**, Addison-Wesley, 2002

M. Fowler, **UML Distilled: A Brief Guide to the Standard Object Modeling Language**, 3ª edicion, Addison-Wesley., 2003

Jean-Michel DOUDOUX, **Développons en Java 2.10**, 2016

Recommendations

Subjects that it is recommended to have taken before

Programming I/V05G301V01105

Contingency plan

Description

In the case of exclusively online teaching, the subject will be organized as follows:

Sessions A.
Synchronous sessions will be carried out weekly through the Remote Campus. In addition, recorded-voice presentations will be published on these platforms, so that the students can access the explanations of each topic at the most convenient time for them, beyond the synchronized sessions. The doubts raised by the students will be resolved through: (i) on-line forums in order to give greater visibility to the teacher's answers in relation to the questions asked by each student, and (ii) virtual tutoring by appointment.

Sessions B.
Synchronous sessions will be carried out weekly through the Remote Campus. Likewise, questions related to the practical part of the subject will be answered through on-line forums and virtual tutoring.

Assessment.
The virtual assessment of the subject will consider the same conditions described in the "Assessment" section of this document, including the same number of tests, identical weighting and minimum grades. It will be organized as follows:

- Sessions A: The theoretical exams (two in continuous assessment and one in exam-only assessment) will be carried out virtually on the dates approved by the Center, using the tools provided by the University of Vigo.

- Sessions B: Java practices will be delivered electronically on officially approved dates. The practical exam will be virtual though the tools proposed by the University of Vigo.