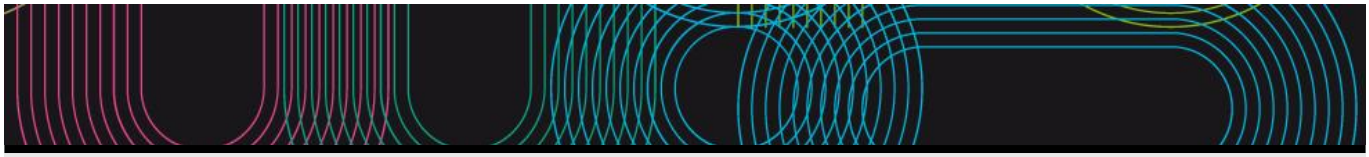

(*)Escola de Enxeñaría de Telecomunicación

Presentatiton

Telecommunications Technical Engineer

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

Master in Industrial Mathematicics

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(*)Grao en Enxeñaría de Tecnoloxías de Telecomunicación

Subjects

Year 1st

Code	Name	Quadmester	Total Cr.
V05G300V01101	Business: Company Fundamentals	1st	6
V05G300V01102	Physics: Fundamentals of Mechanics and Thermodynamics	1st	6
V05G300V01103	Informatics: Computer Architecture	1st	6
V05G300V01104	Mathematics: Linear Algebra	1st	6
V05G300V01105	Mathematics: Calculus I	1st	6
V05G300V01201	Physics: Analysis of Linear Circuits	2nd	6
V05G300V01202	Physics: Fields and Waves	2nd	6
V05G300V01203	Mathematics: Calculus II	2nd	6
V05G300V01204	Mathematics: Probability and Statistics	2nd	6
V05G300V01205	Programming I	2nd	6

IDENTIFYING DATA				
Business: Company Fundamentals				
Subject	Business: Company Fundamentals			
Code	V05G300V01101			
Study programme	(*)Grao en Enxeñaría de Tecnoloxías de Telecomunicación			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Basic education	1st	1st
Teaching language	Spanish			
Department				
Coordinator	González Vázquez, Beatriz			
Lecturers	Álvarez Llorente, Gema González Vázquez, Beatriz			
E-mail	bgonza@uvigo.es			
Web	http://faitic.uvigo.es			
General description	This subject has like objective give to know the organisation, management and institutional frame of the company.			

Competencies	
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		
Manage the requirements and the products of team to reduce the time of realisation of the projects, and improve the coherence and the precision in the business surroundings.	B8	C5	
Propose the solutions of improvement and control the set up.	B4		D2
Establish the guidelines on the metric and indicators that will be used to allow to the Direction of the company the evaluation and the follow-up of the computer systems	B4		D2

Contents	
Topic	
Business administration	(*)1.1 The concept of company. 1.2 The aims of the company. 1.3 The company like system. 1.4 Forms and classes of companies. 1.5 Company and surroundings. 1.6 Surroundings Technologies of Information and Communication.
THE SYSTEM OF FINANCE	(*)2.1 The financial function. 2.2 The investment in the company. 2.3 Sources of finance of the company.
Subject 3: THE SYSTEM OF PRODUCTION I: GENERAL APPEARANCES	(*)3.1 Research, development and technological innovation. 3.2. Function of production. 3.3 Classification of the productive processes. 3.4 The economic programming of the production. 3.5 The productivity: indicators of productivity.
Subject 4: THE SYSTEM OF PRODUCTION II .	(*)4.1 The costs of production. 4.2 Capacity of production and location. 4.3 Control of inventories
Subject 5: THE SYSTEM OF COMMERCIALISATION	(*)5.1 The market. 5.2 The competition. 5.3 The system of commercialisation. 5.4 Marketing-mix.

Subject 6: THE SYSTEM OF *ADMINISTRAtION	6.1. The system of direction. 6.2. Human Resources.
	Practical 1: Typology and nature of the company Practical 2: Surroundings TIC Practical 3: Structure and economic analysis-financial Practical 4: Sources of Finance I Practice 5: Finance II Practice 6: Investment I Practice 7: Decisions of investment in the company II. Practical 8: Production Practical 9: Productivity Practical 10: Costs of Productivity Practical 11: Capacity of production Practical 12: Location business Practical 13: The plan of company

Planning

	Class hours	Hours outside the classroom	Total hours
Master Session	28	56	84
Laboratory practises	26	38	64
Multiple choice tests	1	0	1
Long answer tests and development	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
Master Session	Lesson magistral with material of support and audiovisual means.Realise an exhibition of the main contents of the matter so that the almno can understand the scope of the same and facilitate his understanding. Through this methodology the competencies CG8, CE5, CT2 are developed.
Laboratory practises	Development and resolution of practical cases by means of the use of suitable computer tools for the contents of the matter. The tools to use are inside the available software by the University or will be of free character. Through this methodology the competencies the CG4, CG8, CE5 are developed.

Personalized attention

Methodologies	Description
Master Session	In the classes of laboratory, the professor will guide and will assist to the students that will work in the classroom resolving cases and questions. In the sessions megistrales the professor will attend, will orient and will resolve the doubts to the students on the contents tackled in the theoretical classes. The students will have occasion to attend to tutorías personalised in the dispatch of the professor in the schedule that the professors will establish to such effect to principle of course and that will publish in the page of the asignatura. These tutorías are allocated to resolve doubts and orient to the students on the development of the contents tackled in the theoretical classes, the practical classes. Likewise, also it will keep a constant communication between the educational and the alumnado through the Network by means of the platform Fear in Faitic.
Laboratory practises	In the classes of laboratory, the professor will guide and will assist to the students that will work in the classroom resolving cases and questions. In the sessions megistrales the professor will attend, will orient and will resolve the doubts to the students on the contents tackled in the theoretical classes. The students will have occasion to attend to tutorías personalised in the dispatch of the professor in the schedule that the professors will establish to such effect to principle of course and that will publish in the page of the asignatura. These tutorías are allocated to resolve doubts and orient to the students on the development of the contents tackled in the theoretical classes, the practical classes. Likewise, also it will keep a constant communication between the educational and the alumnado through the Network by means of the platform Fear in Faitic.

Assessment

	Description	Qualification	Training and Learning Results
Multiple choice tests	Proofs scored that will realise along the course, distributed of uniform form and programmed so that they interfere the less possible in the rest of the matters.	40	B4 C5 D2 B8

Long answer tests and development	Final proof that can contain partial or totally the contents of the matter developed in the classes of theory and of practices.	60	B4 B8	C5	D2

Other comments on the Evaluation

Following the own guidelines of the degree will offer two systems of evaluation: continuous evaluation (two options) and non continuous evaluation at the end of the semester. In any of the two systems of evaluation all the competitions of the subject remain evaluated.

1. Continuous evaluation

It will consider that a student has opted by the continuous evaluation when, after knowing the qualification obtained in the first proof, participates in the second.

The continuous evaluation will consist of a group of proofs scheduled and developed along the course, and that will complete with an examination at the end of the semester that will cover total or partially the subject for those students that do not achieve to approve through the proofs realised along the course. Students have a right to review their continuous assessment tests.The proofs will consist so much in the realisation of the practices of the matter, as in two proofs evaluables, that will effect roughly around November and the begginig of december. Said proofs do not free matter, but each one of them will treat on the contents seen until the moment of realisation of the proof, so much in classes of theory as of practices, is thus that will confer to the last proof a greater weight in the calculation of the qualification that the previous, so that the first proof weighs 40%, and the second proof 60% .

To approve the matter through the proofs and remain deleted of the realisation of the examination at the end of the semester, the student has to surpass the last proof, and obtain an average in the qualification of 5. The result that begin the student in this case will be the weighted average note of the two test.

The student has right to know the qualification obtained in each task in a reasonable term after his realisation or delivery. Likewise, these tasks are not recoverable, that is to say, if a student can not fulfil them in the day stipulated the professor does not have obligation to repeat them. The qualification obtained in the tasks evaluables will be valid so only for the academic course in which they realise.

The students that have not approved the matter through the proofs, will have to complete the continuous evaluation realising an examination at the end of the semester that will consist in a proof reduced that will suppose 60% of the note that will add to the note obtained in the continuous evaluation (40% in two proofs) .

2. Students that do not opt by continuous evaluation

To the students that do not opt by the continuous evaluation will offer them a procedure of evaluation that allow them reach the maximum qualification. This procedure will consist in a final examination that include the contents developed in the classes of theory and of practices.

3. On the announcement of recovery

For the announcement of recovery the student that did not approve the subject chooses and confirm by email (a week before the examination) if it wishes to be examined entirely on the maximum possible note or if it applies him the procedure of evaluation stipulated in the subject keeping the note obtained in the previous tasks. By defect, to the student save him the results of the proofs realised.

4. Qualification of No Presented

A student will consider no presented if, at most, has participated in the first proof of continuous evaluation. In any another case, the student will consider presented and will receive his corresponding note.

Sources of information

Bueno Campos, E., **Curso básico de economía de la empresa**, 2004,

Fernández Sánchez, E. y otros, **Iniciación a los negocios para ingenieros. Aspectos funcionales**, 2008,

Pérez Gorostegui, E., **Curso de introducción a la economía de la empresa**, 2009,

Suárez Suárez, A., **Curso de economía de la empresa**, 2001,

Additional

Alegre y otros (2000): Fundamentos de economía de la empresa: perspectiva funcional, *Ariel Economía.*

Barroso Castro C. (coord.) (1996): Casos y cuestiones de economía de la empresa, *Pirámide.*

Bueno Campos, E. (2007): Organización de empresas: estructuras, procesos y modelos *Pirámide.*

Bueno Campos, E. y otros (2000): Economía de la empresa. Análisis de las decisiones empresariales, *Pirámide.*

Casanueva Rocha, C. (2002): Fundamentos de gestión empresarial, *Pirámide*.

Díez de Castro y otros (2002): Introducción a la economía de la empresa I y II, *Pirámide.*

Laborda Castillo, L. y Rafael de Zuani, E. (2005): Introducción a la gestión empresarial: fundamentos teóricos y aplicaciones, *Universidad de Alcalá de Henares*.

López, F. (2009): La empresa explicada de forma sencilla, *Libros de Cabecera S.L. de Libros*.

Luque de

Recommendations

IDENTIFYING DATA				
Physics: Fundamentals of Mechanics and Thermodynamics				
Subject	Physics: Fundamentals of Mechanics and Thermodynamics			
Code	V05G300V01102			
Study programme	(*)Grao en Enxeñaría de Tecnoloxías de Telecomunicación			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Basic education	1st	1st
Teaching language	Spanish			
Department				
Coordinator	Chiussi , Stefano			
Lecturers	Chiussi , Stefano Fernández Doval, Ángel Manuel Fernández Fernández, José Luís			
E-mail	schiussi@uvigo.es			
Web	http://faitic.uvigo.es			
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.			

Competencies	
Code	
B3	CG3: The knowledge of basic subjects and technologies that capacitates the student to learn new methods and technologies, as well as to give him great versatility to confront and update to new situations
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 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 magnitudes 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
Master Session	22	22	44
Case studies / analysis of situations	6	12	18
Troubleshooting and / or exercises	15.5	46.5	62
Laboratory practises	9	13.5	22.5
Multiple choice tests	0.5	0	0.5
Short answer tests	1	0	1
Practical tests, real task execution and / or simulated.	2	0	2

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

Methodologies

	Description
Master Session	Prior personal work: -Preliminary reading of the proposed bibliography on the subject. During the lectures: -Presentation of theoretical concepts. -Experimental demonstrations. -Audiovisual presentations. Ulterior personal work: -Revision of theoretical concepts. -Weak-point identification. -Consult the bibliography. Through this methodology, competencies CG3, CE3, CG5, CG6 are worked out.
Case studies / analysis of situations	Application of the theoretical concepts to simple cases and situations. During the lectures: -Solving of examples. Ulterior personal work: -Solving of cases and situations from the bibliography. -Identification of weak points which require tutorial aid. Through this methodology, competencies CG3, CE3, CG5, CG6 are worked out.
Troubleshooting and / or exercises	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 practises	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 attention

Methodologies	Description
Master Session	- During the practical sessions the lecturers will solve the questions that may arise as the experiments are executed. - The questions related to the theory, its application to the analysis of cases and situations, problem solving, the theory involved in the experiments and the processing of the resulting data, will be solved by the lecturers in their respective tutorial-aid time. - Tutorial aid will be given: = Individually or in small groups (typically of two or three students). = Unless stated otherwise, by appointment to the corresponding lecturer. The appointment will be arranged either by e-mail or in person at the beginning or end of a lecture. = Preferably, in the place and tutorial-aid hours of the corresponding lecturer that will be published in the subject's web page at the beginning of each semester.
Case studies / analysis of situations	- During the practical sessions the lecturers will solve the questions that may arise as the experiments are executed. - The questions related to the theory, its application to the analysis of cases and situations, problem solving, the theory involved in the experiments and the processing of the resulting data, will be solved by the lecturers in their respective tutorial-aid time. - Tutorial aid will be given: = Individually or in small groups (typically of two or three students). = Unless stated otherwise, by appointment to the corresponding lecturer. The appointment will be arranged either by e-mail or in person at the beginning or end of a lecture. = Preferably, in the place and tutorial-aid hours of the corresponding lecturer that will be published in the subject's web page at the beginning of each semester.
Troubleshooting and / or exercises	- During the practical sessions the lecturers will solve the questions that may arise as the experiments are executed. - The questions related to the theory, its application to the analysis of cases and situations, problem solving, the theory involved in the experiments and the processing of the resulting data, will be solved by the lecturers in their respective tutorial-aid time. - Tutorial aid will be given: = Individually or in small groups (typically of two or three students). = Unless stated otherwise, by appointment to the corresponding lecturer. The appointment will be arranged either by e-mail or in person at the beginning or end of a lecture. = Preferably, in the place and tutorial-aid hours of the corresponding lecturer that will be published in the subject's web page at the beginning of each semester.
Laboratory practises	- During the practical sessions the lecturers will solve the questions that may arise as the experiments are executed. - The questions related to the theory, its application to the analysis of cases and situations, problem solving, the theory involved in the experiments and the processing of the resulting data, will be solved by the lecturers in their respective tutorial-aid time. - Tutorial aid will be given: = Individually or in small groups (typically of two or three students). = Unless stated otherwise, by appointment to the corresponding lecturer. The appointment will be arranged either by e-mail or in person at the beginning or end of a lecture. = Preferably, in the place and tutorial-aid hours of the corresponding lecturer that will be published in the subject's web page at the beginning of each semester.

Assessment

	Description	Qualification	Training and Learning Results	
Multiple choice tests	Multiple-choice questions about theoretical concepts. Solving of elementary cases and situations related to the topics in both the classroom and laboratory syllabi.	25	B3 B5 B6	C3
Short answer tests	Short answer questions about theoretical concepts. Solving of elementary cases and situations related to the topics in both the classroom and laboratory syllabi.	25	B3 B5 B6	C3
Practical tests, real task execution and / or simulated.	Practical tests: Solving of problems involving one or more theoretical topics. Execution of real and simulated measurements. Real- and simulated-measurement result processing.	50	B3 B5 B6	C3

Other comments on the Evaluation

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

It will be assumed that a student chooses continuous assessment if he or she takes the 3rd test (see below). Once this test is taken, it will be understood that the student has taken the current term's examination call and he or she will be qualified according to the following criterion regardless of whether he or she takes the final test or not.

1)CONTINUOUS ASSESSMENT

Continuous assessment consists of the tests detailed below in this guide which are not retakeable, i.e, if a student is not able to take them in the scheduled date the teaching staff will not be required to repeat them.

The publication date of the marks and the corresponding checking procedure will be given before the tests. As a general rule, the marks of each test will be published before the next one.

The marks obtained in the tests will be only valid for the academic term they have been obtained.

1st test:

a1) Experimental laboratory test comprising the execution of actual measurements and the processing of the results (mark: 0-1 point).

Length: 30 minutes at the end of experimental laboratory session number 3. Its date will appear in the assessment test schedule that the Academic Board of the Degree will approve.

2nd test:

b1) Combined test with multiple-choice and short-answer questions. Questions about theoretical concepts. Solving of elementary cases and situations related to the topics in the classroom syllabus (mark: 0-1 point).

Length: 30 minutes at the end of one of the problem-solving lectures. Its date will appear in the assessment test schedule that the Academic Board of the Degree will approve.

3rd test:

c1) Experimental laboratory test comprising the execution of actual measurements and the processing of the results (mark: 0-1 point).

Length: 30 minutes at the end of experimental laboratory session number 5. Its date will appear in the assessment test schedule that the Academic Board of the Degree will approve.

4th test, continuous assessment final test:

Combined test with:

d1) 8-12 multiple-choice and short-answer questions, (mark: 0-5 points distributed among them)

e1) solving of one or two problems, (mark: 0-3.4 points distributed between them)

f1) solving of a problem comprising the execution of real or simulated measurements and the processing of the results (mark: 0-1.6 points).

Length: 2 hours in the subject's official examination date.

Overall mark calculation.

g1) will be calculated as the sum of the marks obtained in blocks b1), d1) and e1) plus the lowest of 2 points and the sum of blocks a1), c1) and f1)

$g1 = b1 + d1 + e1 + \min\{ 2 , a1 + c1 + f1 \}$

The overall mark will be the lowest of 10 points or g1)

$\text{overall mark} = \min\{ 10, g1 \}$

2) END-OF-SEMESTER ASSESSMENT

Final overall test:

Combined test with:

d2) 8-12 multiple-choice and short-answer questions, (mark: 0-5 points distributed among them)

e2) solving of one or two problems, (mark: 0-3.4 points distributed between them)

f2) solving of a problem comprising the execution of real or simulated measurements and the processing of the results (mark: 0-1.6 points).

Length: 2 hours in the subject's official examination date.

Overall mark calculation:

g2) will be calculated as the sum of the marks obtained in blocks d2), e2) and f2)

g2 = d2 + e2 + f2

The overall mark will be g2)

overall mark = g2

3) RESIT

Makeup exam:

Combined test with:

d3) 8-12 multiple-choice and short-answer questions, (mark: 0-5 points distributed among them)

e3) solving of one or two problems, (mark: 0-3.4 points distributed between them)

f3) solving of a problem comprising the execution of real or simulated measurements and the processing of the results (mark: 0-1.6 points).

Length: 2 hours in the subject's official resit date.

Final mark calculation:

The students who take the resit will lose the mark of the previous final test and will get a new mark according to the following criteria:

3A) Students who have chosen continuous assessment

g3A) will be calculated as the sum of the marks obtained in blocks b1), d3) and e3) plus the lowest of 2 points and the sum of blocks a1), c1) and f3)

g3A = b1 + d3 + e3 + min{ 2 , a1 + c1 + f3 }

The overall mark will be the lowest of 10 points or g3A)

overall mark = min{ 10, g3A }

3B) Students who have chosen end-of-semester assessment

g3B) will be calculated as the sum of the marks obtained in blocks d3), e3) and f3)

g3B = d3 + e3 + f3

The overall mark will be g3B)

overall mark = g3B

The marks g1), g2), g3A) and g3B) will be considered instead of the corresponding overall marks to assign the "matricula de honor" distinction.

Sources of information
H.D. Young y R.A. Freedman, **Sears-Zemansky. Física Universitaria**, 11, 12 o 13,
I.N. Bronshtein, K.A. Semendiaev, **Manual de Matemáticas para Ingenieros y Estudiantes**,

Recommendations

Subjects that continue the syllabus

Fundamentals of Sound and Image/V05G300V01405
Power Electronics/V05G300V01625
Fundamentals of Acoustics Engineering/V05G300V01531

Subjects that are recommended to be taken simultaneously

Mathematics: Linear Algebra/V05G300V01104
Mathematics: Calculus I/V05G300V01105

Other comments

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

IDENTIFYING DATA				
Informatics: Computer Architecture				
Subject	Informatics: Computer Architecture			
Code	V05G300V01103			
Study programme	(*)Grao en Enxeñaría de Tecnoloxías de Telecomunicación			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Basic education	1st	1st
Teaching language	Spanish			
Department				
Coordinator	Llamas Nistal, Martín Carral Sánchez, Luis			
Lecturers	Álvarez Sabucedo, Luis Modesto Anido Rifón, Luis Eulogio Gil Solla, Alberto Llamas Nistal, Martín Mikic Fonte, Fernando Ariel Santos Gago, Juan Manuel			
E-mail	martin@uvigo.es lcarral@uvigo.es			
Web	http://faitic.uvigo.es			
General description	Computers have become an essential tool. This fact is even more clear while studying the "Bachelor of Engineering in Telecommunications Technology" (Grado en Ingeniería de Tecnologías de Telecomunicación), where computers are not only manipulated from a user's --or specialized user's-- point of view, but also from the engineering perspective, as tools to be designed or to be integrated in more complex systems. Hence, the main motivation for the "Computer Architecture" (Arquitectura de Ordenadores) course is to provide students with an understanding of basic computer operation by studying the lower abstraction levels (over the electronic level). The subject "Computer Architecture" (Arquitectura de Ordenadores) is focused on the conventional machine level, describes the operating machine level and shows an example application for the Symbolic Machine domain through the introduction of the Database Management Systems.			

Competencies	
Code	
B3	CG3: The knowledge of basic subjects and technologies that capacitates the student to learn new methods and technologies, as well as to give him great versatility to confront and update to new situations
B4	CG4: The ability to solve problems with initiative, to make creative decisions and to communicate and transmit knowledge and skills, understanding the ethical and professional responsibility of the Technical Telecommunication Engineer activity.
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: Simplez. Central Processing Unit, Arithmetic and Logic Unit, memries, registries, buses. External Communication, active waiting, Introduction to addressing modes
3. Symbolic Representation and Processing .	Representation of basic data elements: integer, character, floating point. Conventions for data storage. Processing operations. Introduction to simbolic processing. Assembler language
4. Instructions and addressing	4. Instructions and addressing Software considerations. Registries at the conventional machine level. Lenguage for register transfer (RT level). Instruction format. Addressing modes. Stacks and subprograms. Assembler languages
5. Typical conventional machine	Structural Model. Functional Model. Set of instuctions. Addressing modes, Assembler. Examples of programmes. Algortimez
6. Peripheral management	Types of peripherals. Management of variety. Models. Secondary memories. Interruptions. Service Rutines. ADM: justification.
7. Operating Systems	Operative Machine. Introduction to Operating Systems. Definition of an operating system. Interface operating system.
8. Data Bases	Introduction to Data Bases. Relational Model. Entity-relation model. Query languages. Introduction to SQL

Planning			
	Class hours	Hours outside the classroom	Total hours
Laboratory practises	22	27.5	49.5
Introductory activities	5	5	10
Troubleshooting and / or exercises	10	17.5	27.5
Master Session	12	24	36
Self-assessment tests	0	3	3
Practical tests, real task execution and / or simulated.	4	8	12
Short answer tests	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 practises	The course includes programming practices that will performed using a simple computer (SIMPLEZ) and a regular computer (ALGORITMEZ). Through this methodology the competencies CG3, CG4, CT2, CT3 and CE2 are developed.
Introductory activities	Presentation of the course contents, methodology, office hours, evaluation, usage of the labs, and any other issue related to the subject. Through this methodology the competences CG3 and CT3 are developed.
Troubleshooting and / or exercises	Programming, information representation, and other problems and exercises will be solved during the classes. Some must be solved by students previously at home, and they will participate actively in the solution of some other problems. Through this methodology the competencies CG, CT2 and CE2 are developed.
Master Session	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 attention	
Methodologies	**Description**

Master Session	The students will have opportunity to attend personalized tutorials in the schedule to be established for this purpose at the beginning of the course. This schedule is published on the website of the subject and the website of the center .
Laboratory practises	The students will have opportunity to attend personalized tutorials in the schedule to be established for this purpose at the beginning of the course. This schedule is published on the website of the subject and the website of the center .
Troubleshooting and / or exercises	The students will have opportunity to attend personalized tutorials in the schedule to be established for this purpose at the beginning of the course. This schedule is published on the website of the subject and the website of the center .

Assessment

	Description	Qualification	Training and Learning Results	
Self-assessment tests	Exam questions will be available for students, in order to perform autoevaluation.	0	B3 B4	C2
Practical tests, real task execution and / or simulated.	Three practical exams (ongoing evaluation) will be performed in laboratory.	50	B3 B4	C2
Short answer tests	Three exams (ongoing evaluation) will be performed to evaluate the theory.	50	B3 B4	C2

Other comments on the Evaluation

This subject is organized in two parts: Theory and Practice.We consider the harmonic average of A and B as HA(A,B)=2*A*B/(A+B). If A=B=0 then HA(A,B)=0And the Arithmetic Average of A and B as AA(A,B)=(A+B)/2
The final grade for the course (FG) is the harmonic average (HA) of both parts, TG (Theory Grade) and PG (Practice Grade). Namely
FG = HA(TG,PG) = 2*TG*PG/(TG+PG)
To pass the course, FG must be greater than or equal to 5. If HA(TG,PG)4 then FG=4).
Both parts can be evaluated by Continuous Evaluation (CE) or by Final Exam (FE).
The FE will consist of Theory and Practice, and will take place in date and time officially established.
EC will consist of the tasks described in this guide, and are not recoverable, ie, if a student cannot comply within the stipulated period the teacher is not required to repeat them.
If one of the subject parts is passed in the final semester examinations, its grade will be kept for the remedial examinations where the student only must be evaluated of the other part. If the student has followed CE in part that remains, he/she will keep the grades.
The CE tasks grades are only valid for the current academic course, being discarded in case the student fails the course.

THEORY
The Theory part is divided into two subparts: T1 and T2. T1 covers approximately 66% of the syllabus, while T2 the 100% of the syllabus.
The Theory grade is the harmonic average of the grades of these two subparts, ie:
TG = HA(T1,T2) = 2*T1*T2/(T1+T2)

*CONTINUOUS EVALUATION (CE):
In CE in Theory, the T1 subpart consists of two exercises (CE1 and CE2) and T2 subpart of one exercise. They will be done approximately in the 5th week, 10th week and the final exam (ie, the third exercise is part of the Review Final) .
The syllabus is about 33% of the total for the first exercise (CE1), 66% for the second (CE2) and 100% for the third (T2).
The note of the first subpart is T1 = HA(CE1,CE2)

If the student has followed CE but has failed the subject, the T1 and T2 grades will be kept for remedial examinations.

*SEMESTER FINAL EXAM
Any student, whether or not has followed the CE, can take the Final Exam. If the student followed the CE, he/she may discard the results obtained there, and take the Final Exam . In this case, the valid grade will be the FE, canceling the grades that had been obtained previously in the CE.
This Final Exam will have two exercises (T1 and T2) to be done in 90 minutes. Students who have not passed CE will have to present to the entire Final Exam (T1 and T2).

* REMEDIAL EXAMS
The Theory Remedial Exam has the same structure as in the Semester Final Exam and will last 90 minutes. If CE was not followed, the student will have to do both T1 and T2, regardless of the grades in each exercise in Final Semester Exam. If EC was followed, the student can do T1 and/or T2, canceling the grades that he/she had previously obtained.

PRACTICE
*CONTINUOUS EVALUATION:
The CE of Practice consists of 3 exercises P1, P2 and P3 . P1 will be about Simplez, P2 about Basic Algoritmez (over 60% of the syllabus) and P3 about Full Algoritmez (100% of the syllabus). The exercises will be done in the laboratory and will last approximately 1 hour. P1 will be around the 4th week, P2 around the 8th P2 and P3 around the last week .The Practice CE grade is the weighted average of these three exercises: PG = 0.20*P1 + 0.35*P2 + 0.45*P3

*SEMESTER FINAL EXAM
Any student, whether or not has followed the CE, can take the Final Exam. If the student followed the CE, he/she may discard the results obtained there, and take the Final Exam . In this case, the valid grade will be the FE, canceling the grades that had been obtained previously in the CE.
This Final Exam will have one exercise about Algoritmez to be done in the laboratory in 1 hour (approximately).
In this case, the Practice Grade is the grade of the Final Exam.

* REMEDIAL EXAM
The student will have a Remedial Exam similar to the Semester Final Exam.

GENERAL ISSUES
ACTS- For the CE to be considered in Acts, the student will have do exercise P1 in Practice or EC1 in Theory. Any student following the CE who does not do any of these exercises (P1 or EC1):
His/her grade will not be registered in the acts and, for all purposes, will be treated as those presented for the first time, without having studied before.
He/she could not take the other CE exercises, as they will not be considered.
Note: Prior to an exercise or an exam, the date and procedure for the score review will be published sufficiently in advance.

Sources of information
Gregorio Fernández Fernández, **Curso de Ordenadores. Conceptos básicos de arquitectura y sistemas operativos.**, 5ª,
Silberschatz, H.F. Horth y S. Sudarshan, **Fundamentos de Bases de Datos.**, 2ª,
A. S. Tanenbaum, **Organización de Computadoras. Un enfoque estructurado.**, 4ª,
J.L. Hennessy y D.A. Patterson, **Arquitectura de los Computadores. Un enfoque cuantitativo**,
Martín Llamas Nistal, Fernando A. Mikic Fonte y Manuel J. Fernández Iglesias, **Arquitectura de Ordenadores: Problemas y Cuestiones de Teoría**, 1ª,
Alberto Gil Solla, **Ejercicios resueltos sobre Fundamentos de los Ordenadores**, 1ª,
Alberto Gil Solla, **Problemas resueltos de programación en ensamblador**, 1ª,
Fernando A. Mikic Fonte y Martín Llamas Nistal, **Arquitectura de Ordenadores: Problemas de Programación en Ensamblador**, 1ª,

ADITIONAL BIBLIOGRABHY:

[Cos98] C. Costilla Rodríguez. 1996. Introducción a las Bases de Datos Modernas. Dpto. Publicaciones ETSIT Madrid. ISBN 84-605-6469-X

[Dat99] C.J. Date. An introduction to database systems (Vols. 1 y 2) . Séptima edición. Addion-Wesley. ISBN-10: 0201385902, ISBN-13: 978-0201385908

[Dat01] C.J. Date. 2001. Introducción a los Sistemas de Bases de Datos. Pearson Educación. ISBN : 968-444-419-2

[EN02] R.A. Elmasri and S.B. Navathe. 2002. Fundamentos de Sistemas de Bases de Datos. Pearson Educación. ISBN 978-84-782-9085-7

[FMH01] I.M. Flynn y A. McIver McHoes. 2001. Sistemas Operativos (tercera edición) . Thomson Learning. ISBN: 534376665

[GUW02] H. García-Molina, J.D. Ullman y J. Widom. 2002. Database Systems. The Complete Book . Prentice-Hall. ISBN 0137135262

[HVZ87] V.C. Hamacher, Z.G. Vranesic, S.G. Zaky, 1987. Organización de Computadoras (2ª ed.) McGraw-Hill.

[PH95] D. A. Patterson y J.L. Hennessy (Traducido por J.M. Sánchez), 1995. Organización y diseño de Computadores. La interfaz hardware/software. McGraw-Hill. 1-55860-281-X.

[SBG02] A. Silberschatz, P. Baer Galvin, G. Gagne. 2002. Sistemas Operativos (sexta edición). Limusa-Wiley. ISBN: 9681858220

Recommendations

IDENTIFYING DATA				
Mathematics: Linear Algebra				
Subject	Mathematics: Linear Algebra			
Code	V05G300V01104			
Study programme	(*)Grao en Enxeñaría de Tecnoloxías de Telecomunicación			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Basic education	1st	1st
Teaching language	Spanish			
Department				
Coordinator	Martín Méndez, Alberto Lucio			
Lecturers	Faro Rivas, Emilio Martín Méndez, Alberto Lucio Prieto Gómez, Cristina Magdalena			
E-mail	amartin@dma.uvigo.es			
Web	http://faitic.uvigo.es/			
General description	The subject Álgebra Lineal is taught in the first quadmester of the first course of the Grado en Ingeniería de Tecnologías de Telecomunicación, with the main objective of providing students with a correct management of the elementary mathematical symbolism, the basic techniques of the matrix calculus and an introduction to the methods of resolution of problems that serve as a basis for subjects to study later. It will be paid special attention to the applications of Linear Algebra, as well as to the part of Numerical Analysis which is related to the subject.			

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

Learning outcomes			
Expected results from this subject	Training and Learning Results		
Domain of the basic techniques of linear algebra and matrix calculus which are needed in other subjects that should be studied subsequently in the programme.	B3 B4	C1	D2 D3
Management of the basic operations of matrix calculation.	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	
Management of some applications of linear algebra: the method of least squares, singular value decomposition and classification of quadratic forms	B3	C1	D3
Domain of the arithmetic of complex numbers.	B3 B4	C1	D2 D3

Contents	
Topic	
Subject 1. Complex numbers.	Operations with complex numbers. Geometric concepts associated with complex numbers. Euler's formula and its consequences.
Subject 2. Systems of linear equations and matrices.	Solution of a system of linear equations. Systems of linear equations and vector equations. The matrix equation Ax=b. Sets of solutions of systems of linear equations. Operations with matrices. Inverse of a matrix. Block matrices. LU decomposition. Determinants. Rank of a matrix.

Subject 3. Linear transformations	Relations of linear dependence. Subspaces. Basis. Dimension. Rank of a system of vectors. Introduction to linear transformations. Matrix of a linear transformation. Composition of linear transformations.
Subject 4. Eigenvalues and eigenvectors.	Eigenvalues and eigenvectors. Eigenspace. Diagonalizable matrices.
Subject 5. Orthogonallity.	Real Euclidean inner product. Complex Euclidean inner product. Orthogonallity. Diagonalization by unitary similarity. Singular value decomposition. Matrix rank reduction. The method of least squares. Quadratic forms.

Planning

	Class hours	Hours outside the classroom	Total hours
Laboratory practises	2	2	4
Master Session	38	76	114
Troubleshooting and / or exercises	9	9	18
Troubleshooting and / or exercises	5	5	10
Long answer tests and development	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 practises	Use of the computer tool *MATLAB. Through this methodology the competences CG3, CG4, CE1, CT2 and CT3 are developed.
Master Session	Explanation and development by the professor of the contents of the various items that make up the course. Through this methodology the competences CG3, CE1 and CT3 are developed.
Troubleshooting and / or exercises	Resolution by part of the professor of suitable exercises adapted to each topic and suitable exercises to reveal the relations of the topics between themselves. The student will have to also 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 attention

Methodologies	**Description**
Troubleshooting and / or exercises	Students will have the opportunity to attend personal tutoring in the professor's office in the hours established, as announced at the beginning of the course and published on the course web page. The professor will personally help students in order to clarify the doubts that they may have about the contents of the subject or the problems solved. He also personally attend students who have questions about exercises sought by themselves.
Laboratory practises	Students will have the opportunity to attend personal tutoring in the professor's office in the hours established, as announced at the beginning of the course and published on the course web page. The professor will personally help students in order to clarify the doubts that they may have about the contents of the subject or the problems solved. He also personally attend students who have questions about exercises sought by themselves.
Master Session	Students will have the opportunity to attend personal tutoring in the professor's office in the hours established, as announced at the beginning of the course and published on the course web page. The professor will personally help students in order to clarify the doubts that they may have about the contents of the subject or the problems solved. He also personally attend students who have questions about exercises sought by themselves.
Tests	**Description**
Troubleshooting and / or exercises	Students will have the opportunity to attend personal tutoring in the professor's office in the hours established, as announced at the beginning of the course and published on the course web page. The professor will personally help students in order to clarify the doubts that they may have about the contents of the subject or the problems solved. He also personally attend students who have questions about exercises sought by themselves.

Assessment

	Description	Qualification	Training and Learning Results

Troubleshooting and / or exercises	Following the guidelines specific to the degree program, two systems of assessment will be offered: continuous evaluation and evaluation at the end of the quadmester. In the case of continuous evaluation planning will be in the following way: Four one hour testing: 1. Test of item 1 (week 3 approximately). 2. Test of items 2 and 3 (week 10 approximately). 3. Test of items 4 and 5 (week 14 approximately). 4. Exercise for solving by small groups and in an individual way (week 14 approximately). Each of these tests will have an evaluation of 1,10 points. In adittion, 6% of the rating will be obtained by means of tasks to deliver in the classroom	50	B3 B4	C1
Long answer tests and development	An individual test of two hours of items 1, 2, 3, 4, 5 and 6.	50	B3 B4	C1

Other comments on the Evaluation

Continuous evaluation:

It will be considered that a student has opted by the continuous evaluation when, after knowing the qualification obtained in the first test of an hour, he accept to take part in it. In this case, the final qualification for a student is given by the formula

N = (1/2) x T + (1/2) x E

where T is the qualification, between 0 and 10, obtained as the weighted average of the qualifications of the five tests of an hour and where E is the qualification, between 0 and 10, obtained in the test of two hours. In this mode, it is considered that a student has successfully completed the course when N is greater than or equal to 5. Before the completion or delivery of each test, the date and procedure for the review of the qualifications obtained will de indicated; these qualifications will be open to the students in a reasonable period of time. The tests are not recoverable, in other words, if a student cannot present himself to realize them in the day stipulated, the professor does not have obligation to repeat them.

Qualifications obtained in the evaluables tests will be valid only for the academic course in which they are realized.

Evaluation at the end of the quadmester:

Students who do not choose continuous evaluation may be submitted to an examination, which will not necessarily be the same as the single test of two hours of items 1, 2, 3, 4 and 5 of the students that follow the continuous evaluation, which will be evaluated on 10 points. In this mode, it is considered that a student has successfully completed the course when the qualification of the examination is greater than or equal to 5.

Second chance:

The day of the test of recovery, students who have chosen continuous evaluación will be able to opt, if they wish it and before seeing it, for a test where the note is obtained as

N = (1/2) x T + (1/2) x D

where T is the qualification, between 0 and 10, obtained as the weighted average of the qualifications of the five tests of an hour and where D is the qualification, between 0 and 10, obtained in a three-hour maximum test of items 1, 2, 3, 4 and 5. In this mode, it is considered that a student has successfully completed the course when NR is greater than or equal to 5.

In case of not choosing this option, or if they do not qualify to choose it because they have not participated in the continuous evaluation, the recovery examination, not necessarily the same as that taken by the students who have chosen the above mentioned option, will be also a three-hour maximum test of items 1, 2, 3, 4 and 5. In this case, the test will be evaluated on 10 points and it will be considered that a student has successfully completed the course when the qualification of the test is greater than or equal to 5.

Qualification of Not Present:

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

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

Sources of information
D. C. Lay, **Álgebra lineal y sus aplicaciones**, 3ª,
D. Poole, **Álgebra lineal: Una introducción moderna**, 2º,
L. Merino; E. Santos, **Álgebra lineal con métodos elementales**, 1ª,

Recommendations
Subjects that continue the syllabus
Physics: Analysis of Linear Circuits/V05G300V01201
Physics: Fields and Waves/V05G300V01202
Mathematics: Calculus II/V05G300V01203
Mathematics: Probability and Statistics/V05G300V01204
Digital Signal Processing/V05G300V01304
Computer Networks/V05G300V01403
Subjects that are recommended to be taken simultaneously
Mathematics: Calculus I/V05G300V01105

IDENTIFYING DATA				
Mathematics: Calculus I				
Subject	Mathematics: Calculus I			
Code	V05G300V01105			
Study programme	(*)Grao en Enxeñaría de Tecnoloxías de Telecomunicación			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Basic education	1st	1st
Teaching language	Spanish			
Department				
Coordinator	Calvo Ruibal, Natividad			
Lecturers	Calvo Ruibal, Natividad Fernández Manin, Generosa González Rodríguez, Ramón Martín Méndez, Alberto Lucio			
E-mail	nati@dma.uvigo.es			
Web	http://faitic.uvigo.es			
General description	The aim that pursue with this subject is that the student know the basic technicians of the differential calculation in one and several real variables and his applications. Al term of this subject it expects that the student have achieved the understanding of the basic concepts of the differential calculation in one and several variables, the handle of the usual differential operators of the mathematical physics and of the technicians of differential calculation for the research of extremes, local approximation of functions and numerical resolution of systems of equations. Besides, it will have to know handle some computer program of symbolic calculation and graphic representation.			

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

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

Contents	
Topic	
Subject 1. Introduction.	Sets of numbers and functions of one variable. n-dimensional space. Polar, cylindrical and spherical coordinates.

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

Planning

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

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

Methodologies

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

Personalized attention

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

Assessment

	Description	Qualification	Training and Learning Results

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

Other comments on the Evaluation

1. Continuous evaluation

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

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

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

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

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

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

2. Evaluation at the end of the semester

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

3. Second chance

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

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

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

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

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

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

4. Qualification of Not Present

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

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

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

Recommendations
Subjects that continue the syllabus
Physics: Analysis of Linear Circuits/V05G300V01201
Physics: Fields and Waves/V05G300V01202
Mathematics: Calculus II/V05G300V01203
Mathematics: Probability and Statistics/V05G300V01204
Digital Signal Processing/V05G300V01304
Electromagnetic Transmission/V05G300V01303
Subjects that are recommended to be taken simultaneously
Mathematics: Linear Algebra/V05G300V01104

IDENTIFYING DATA				
Physics: Analysis of Linear Circuits				
Subject	Physics: Analysis of Linear Circuits			
Code	V05G300V01201			
Study programme	(*)Grao en Enxeñaría de Tecnoloxías de Telecomunicación			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Basic education	1st	2nd
Teaching language	Spanish			
Department				
Coordinator	García-Tuñón Blanca, Inés			
Lecturers	Díaz Otero, Francisco Javier García-Tuñón Blanca, Inés Gómez Araújo, Marta Prol Rodríguez, Miguel Sánchez Sánchez, Enrique			
E-mail	inesgt@com.uvigo.es			
Web	http://www.faitic.uvigo.es			
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 and Fourier transforms).			

Competencies	
Code	
B3	CG3: The knowledge of basic subjects and technologies that capacitates the student to learn new methods and technologies, as well as to give him great versatility to confront and update to new situations
B4	CG4: The ability to solve problems with initiative, to make creative decisions and to communicate and transmit knowledge and skills, understanding the ethical and professional responsibility of the Technical Telecommunication Engineer activity.
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	Fundamental and derived magnitudes. Active and passive elements and their functional relationships. Kirchhoff's laws. Simplifying techniques; Thévenin and Norton equivalent circuits. Analysis by the technique of mesh voltages. Analysis by the techniques of node currents.

II: Transient Response	Transient and steady-state regimes. Transient regime origin. Conditions of study (transient between two steady-state continuous regimes, two reactive elements as a maximum). Inductors and capacitors in steady-state continuous regime. Single reactive element networks: time expression, time constant. Two reactive elements networks: types of responses, time expressions, damping coefficient, angular resonant frequency. Networks changing in several time values. Partially coupled elements networks.
III: Steady-state sinusoidal response	Definition and parameters. Concepts of phasor and impedance. Mesh and node analysis of steady-state sinusoidal regime networks. Autoinductance and mutual inductance. Linear and ideal transformers. Power expressions: instantaneous power, complex power, average power, reactive power. Thévenin and Norton equivalent circuits. Frequency response. Using the superposition principle.
IV: Two-ports	Definition of a two-port circuit. Characteristic parameters. Sets of characteristic parameters. Characteristic parameters determination. Combining two-ports. A two-port in a circuit.
V: Signals and systems	lasses of signals. Some relevant signals: step function, unit impulse function, exponential function, sinusoidal function. Classes of systems. System properties; linear, time invariant systems; response to impulse.
VI: Laplace transform	Definition. Direct transforms. Inverse transform determination. Application to linear circuits. The transference function. Steady-state response in a circuit. Response for a sinusoidal input. Application of the superposition principle.
VII: Fourier transform	Fourier series expansion. Expressions of Fourier series expansion. Amplitude and phase spectra. Frequency response. Fourier transform. Fourier transform expressions. Properties: linearity, simmetry, time displacement, time/frequency scaling, modulation.
VIII: Filters.	Filter concept. Filter classes. Ideal and real filters. Low pass prototype based design. Filter responses.

Planning

	Class hours	Hours outside the classroom	Total hours
Introductory activities	1	0	1
Master Session	27	54	81
Practice in computer rooms	16	16	32
Laboratory practises	3	3	6
Troubleshooting and / or exercises	3	9	12
Practical tests, real task execution and / or simulated.	4	8	12
Long answer tests and development	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
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.
Master Session	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.
Practice in computer rooms	PSpice and Matlab will be used to solve exercises of circuit simulation in 8 2-hour sessions (16 hours in total). Theses sessions will start with supervised either individual or team problem solving of practical applications related to the theoretical content of the subject. The solutions will be analyzed, checked and compared using the computational tools aforementioned. Through this methodology the competencies CG3, CG4 and CE4 are developed.
Laboratory practises	Two practical sessions will be carried out in the hardware lab, assembling and measuring circuits tasks will be covered. A total of 4 hours, with 1 hours dedicated to the evaluation of these sessions. Through this methodology the competencies CG3, CG4 and CE4 are developed.

Personalized attention

Methodologies	Description
Master Session	Personal attention will be carried out under student demand, at the professor room and/or at the laboratories, during the time schedules established and posted by the instructors at the beginning of the course.
Laboratory practises	Personal attention will be carried out under student demand, at the professor room and/or at the laboratories, during the time schedules established and posted by the instructors at the beginning of the course.
Practice in computer rooms	Personal attention will be carried out under student demand, at the professor room and/or at the laboratories, during the time schedules established and posted by the instructors at the beginning of the course.

Assessment

	Description	Qualification	Training and Learning Results	
Troubleshooting and / or exercises	These tests will also take place in Group B timetable, along with the practical tests and circuit simulation. So they are expected to be carried out in week 5 (EC1 Chapters 1 and 2), 9 (EC2 Chapters 3 and 4) and 15 (EC3 Chapters 5 to 8). The punctuation of each of these tests will be: 1.5, 2.5 and 2.0 points respectively. Each tests is related to one or two of the most important chapters of the subject. Each tests will consist on two or more exercise or questions.	60	B3 B4	C4
Practical tests, real task execution and / or simulated.	The following tasks/tests will be carried out in Group B timetable. There will be 4 tests/tasks during the semester: 1. Test in PCs lab: 3 tests related to circuit simulation exercises, using PSPICE and Matlab. These tests will be carried out jointly with problem solving and/or other exercises, to be expected in week 5 (EC1 Chapters 1 and 2), 9 (EC2 Chapters 3 and 4) and 15 (EC3 Chapters 5 and 6). The punctuation of each of these tests will be 0.5, 1.0 and 1.0 respectively. 2. Tests in lab 1: test related to assembling and measuring circuits. This test is expected to be carried out in week 11 with a maximum punctuation of 1.5 points. The following skills will be evaluated: teamwork, fit to design specifications and presenting results.	40	B3 B4	C4

Long answer tests and development	Additionally to the continuous evaluation system based on the results achieved on the aforementioned tests, the students will have the option of a final examination.	0	B3 B4	C4

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 (end of semester). The student is free to choose the continuous evaluation system above described, without excluding the possibility to do a final exam. Possible cases:

- Students only doing the continuous evaluation: they are graded with the points obtained in the evaluation.
- Students doing both the continuous evaluation and the exam: they are graded with the best of both qualifications.
- Students only doing the final exam: they are graded with the points obtained in the exam.

Details of the final examination: The final exam will have three parts, each of them corresponding to each of the tests related to problem solving and/or exercises carried out during the continuous evaluation: EC1 (Chapters I and II), EC2 (Chapters III and IV) and EC3 (Chapters V to VIII). The students will be able to choose to do the full exam or only those parts that they wish to improve the grade obtained during continuous evaluation.

2. Extraordinary exam. Students that do not reach the minimum grade at the end of the semester will have the option to do a final extraordinary exam of the full content of the subject, theory and practice. The extraordinary exam can include test type and/or reasoning questions, problem solving and/or exercises, as well as the development of practical cases. The maximum punctuation achieved on this exam (between 0 and 10) will be the final grade. It will replace the grade obtained during continuous evaluation (sum of the grades obtained during tests and final exam)

Additional comments:

- The continuous evaluation tests will take place in group B, so the students must attend to the group assigned at the beginning of the semester.
- Doing 2 or more tests and/or the final exams will prevent the student to get the "Not presented" mark.
- The average grade during continuous evaluation will only be valid only for the corresponding academic year.
- It will be considered that the subject has been passed if the final grade is equal or above 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.

Sources of information

James W. Nilsson, **Electric Circuits**,

Enrique Sánchez, Carmen García Mateo, **Material docente**, Página web,

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

J. W. Nilsson's book will be the basic course reference. It is a book covering all the course content in more extension and by using a very clear language. It includes a number of exercises, both proposed and solved. A number of editions are available, in general with little differences among them. It is recommended to the students to use the English editions.

Additionally, the students will have available in the course web site some teaching material (extended lectures notes, practice handbooks, exam examples).

McClellan et al. book is mentioned as a complementary reference, specially indicated for signal processing and filtering lessons. This book will be used in a second year course devoted to digital signal processing.

Recommendations

Subjects that continue the syllabus

Physics: Fundamentals of Electronics/V05G300V01305
Digital Signal Processing/V05G300V01304
Signal Transmission and Reception Techniques/V05G300V01404

Microwave Circuits/V05G300V01611
Radio Frequency Circuits/V05G300V01511
Analogue Electronics/V05G300V01624
Engineering of Electronic Equipment/V05G300V01523

Subjects that are recommended to be taken simultaneously

Mathematics: Calculus II/V05G300V01203

Subjects that it is recommended to have taken before

Mathematics: Linear Algebra/V05G300V01104
Mathematics: Calculus I/V05G300V01105

Other comments

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

IDENTIFYING DATA				
Physics: Fields and Waves				
Subject	Physics: Fields and Waves			
Code	V05G300V01202			
Study programme	(*)Grao en Enxeñaría de Tecnoloxías de Telecomunicación			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Basic education	1st	2nd
Teaching language	Spanish Galician			
Department				
Coordinator	Obelleiro Basteiro, Fernando			
Lecturers	Fraile Peláez, Francisco Javier García Pino, Antonio García-Tuñón Blanca, Inés Gómez Araújo, Marta González Valdés, Borja Obelleiro Basteiro, Fernando Rubiños López, José Óscar Vazquez Alejos, Ana Vera Isasa, María			
E-mail	obi@com.uvigo.es			
Web	http://faitic.uvigo.es			
General description	Fields and Waves presents the first contact in the student's degree with the phenomena of electromagnetic waves, which are the physical medium for transmission of information. Mathematical modeling of electromagnetic fields that provide insights into the behavior of electromagnetic waves in real environments will be introduced.			

Competencies	
Code	
B3	CG3: The knowledge of basic subjects and technologies that capacitates the student to learn new methods and technologies, as well as to give him great versatility to confront and update to new situations
C1	CE1/FB1: The ability to solve mathematical problems in Engineering. The aptitude to apply knowledge about linear algebra, geometry, differential geometry, differential and integral calculus, differential and partial derivatives equations; numerical methods, numerical algorithms, statistics and optimization
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		
Resolve problems applying the laws of Ampère, Gauss and Faraday.	B3	C1 C3	D3
Know and apply the Maxwell Equations	B3	C1 C3	D3
Calculate the main parameters of the electromagnetic waves: frequency, wavelength, propagation constant, polarization, Poynting vector, phase constant, attenuation constant.	B3	C3	D3
Analyze the propagación of waves in media with and without losses.	B3	C3	D3

Contents	
Topic	
1. Vector and differential analysis of fields	1.1 Scalar and vector fields 1.2 Systems of coordinates in space 1.3 Vector Algebra 1.4 Integral Operators 1.5 Differential operators 1.6 Properties of operators

2. Electrostatic fields	2.1 Sources of the electrostatic field 2.2 Equations of the electrostatic field, electric potential 2.3 Electrostatic fields produced by charge distributions 2.4 Equations of Poisson and Laplace 2.5 Electrostatic field in material media
3. Magnetostatic fields	3.1 Sources of magnetostatic field 3.2 Magnetostatic field equations 3.3 Magnetostatic field produced by current distributions 3.4 Magnetostatic filed in material media
4. Maxwell Model	4.1 Maxwell's equations in integral form 4.2 Differential form of Maxwell's equations 4.3 Boundary conditions. 4.4 Energy balance of the electromagnetic field 4.5 Harmonic time variation 4.6 Harmonic time variation in material media
5. Wave equation and its solutions	5.1 Wave equation for time harmonic fields 5.2 Propagation, attenuation and phase constants 5.3 Solutions in rectangular coordinates 5.4 Progressive, stationary and evanescent waves in lossy and losseless media
6. Uniform plane waves	6.1 Expressions of the fields 6.2 Characteristic impedance 6.3 Poynting Vector 6.4 Polarization
7. Waves in the presence of obstacles	7.1 Incident wave, scattered wave and transmitted wave 7.2 Standing waves 7.3 Standing wave pattern 7.4 Polarization and power

Planning

	Class hours	Hours outside the classroom	Total hours
Master Session	25	37.5	62.5
Case studies / analysis of situations	12	18	30
Troubleshooting and / or exercises	16	24	40
Troubleshooting and / or exercises	1	2.5	3.5
Long answer tests and development	2	12	14

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

Methodologies

	Description
Master Session	Exhibition by the professor of the contents on the matter object of study, theoretical bases and/or guidelines of a work, exercise or project to develop by the student. Through this methodology the competencies CG3, CE1 and CT3 are developed.
Case studies / analysis of situations	Analysis of a fact, problem or real event with the purpose to know it, interpret it, resolve it, generate hypothesis, contrast data, think about it, complete knowledges, diagnose it and train in alternative procedures of solution. Through this methodology the competencies CG3, CE1, CE2 and CT3 are developed.
Troubleshooting and / or exercises	Problems and/or exercises related with the subject are formulated. The student has to develop the suitable or correct solutions by development of routines, the application of formulas or algorithms, the application of procedures of transformation of the available information and the interpretation of the results. I complement of the lectures. Through this methodology the competencies CG3, CE1, CE2 and CT3 are developed.

Personalized attention

Methodologies	Description
Master Session	The students will have occasion of atend to personalized tutorial sessions in the officce of the professor during the schedule established for that at the begining of the course. The schedule will be published in the web page of the subject. Students will be able to also pose his queries by e-mail.
Troubleshooting and / or exercises	The students will have occasion of atend to personalized tutorial sessions in the officce of the professor during the schedule established for that at the begining of the course. The schedule will be published in the web page of the subject. Students will be able to also pose his queries by e-mail.

Case studies / analysis of situations	The students will have occasion of atend to personalized tutorial sessions in the officce of the professor during the schedule established for that at the begining of the course. The schedule will be published in the web page of the subject. Students will be able to also pose his queries by e-mail.

Assessment

	Description	Qualification	Training and Learning Results	
Troubleshooting and / or exercises	Proof in which the students have to solve series of problems and/or exercises in a time/condition established by the professor. In this way, the students have to apply their knowledge.	40	B3	C1 C3
Long answer tests and development	Final examination: Proof for evaluation of the skills that includes open questions on a subject. The students have to develop, relate, organise and present their knowledge about the subject in an extensive answer.	60	B3	C1 C3

Other comments on the Evaluation

Following the policy guidelines of the Center, the students can choose between two systems of evaluation: continuous evaluation and evaluation at the end of the term.

1. CONTINUOUS EVALUATION.

- The system of continuous evaluation (CE) will consist in a problems/questions solving test on units/topics 1, 2 and 3 of he syllabus. It will be takenaround the 8th week of the term. The weight of this test will be the 40% of the final grade, with a maximum score of 4 points.
- Before the completion or delivery of the test, the date and procedure for the review of the obtained grades will be indicated. Students will have the option to know the status of the test and review the correction within a reasonable period of time.
- This test is not recoverable, what means that if a student cannot fulfill it in the stipulated period and terms, teachers will not be committed to repeat it.
- The grade obtained in the continuous evaluation test (CE1) will be valid only for the current academic course.
- It will be understood that a student follows the CE system whenever he takes the test CE1.

2. END OF THE TERM EXAM

- The exam will be divided in two parts: EX1 (topics 1 to 3) with a maximum value of 4 points, and EX2 (topics 4 to 7) with a maximum value of 6 points.
- All the students must take this exam in order to pass the course on first call.
- Two cases must be considered:
    - Students that did not follow the continuous evaluation:
        - The grade will be straightforwardly obtained from the final exam (FE) as the sum of the grades of the two parts of the exam: FE = EX1 + EX2.
    - Students that followed the continuous evaluation:
        - They must take the second part of the exam (EX2). EX2 will be graded from 0 to 6 points and will be saved as the second part of the continuous evaluation (CE2) until the July exam (CE2 = EX2).
        - The student may choose to do the first part of the exam (EX1); if so, it only will be taken into account when the grade obtained improves the result obtained in the continuous evaluation test (CE1).
        - Thus, the final grace will be obtained as: FE = max (EX1, CE1) + EX2.

3. JUNE-JULY EXAM.

- The June-July exam (or recovery exam) will be divided in two parts: EX1 (topics 1 to 3) with a maximum value of 4 points, and EX2 (topics 4 to 7) with a maximum value of 6 points.
- Regarding the students that did not follow the continuous evaluation, their final grade will be straightforwardly obtained from this final exam as the sum of the grades of the two parts of the exam: FE = EX1 + EX2.

- The students that followed the continuous evaluation will choose to do: only EX1, only EX2, or both parts. The final grade will be: FE = max(EX1, CE1) + max(EX2, CE2), being EX1 and EX2 the grades obtained in each part of the recovery exam, CE1 the continuous evaluation grade, and CE2 the continuous evaluation grade corresponding to the second part of the course (obtained in the second part of the end of term exam).

4. NOTES

- It is considered that a student has taken the course when he has done the continuous evaluation test (CE1) or any of the two exams (end of term exam or recovery exam). Any student who takes the continuous evaluation test (CE1) will be graded, regardless of he/she takes or not the other two exams (end of term exam or recovery exam).
- In order to pass the course, students must receive a grade of 5 or above.

Sources of information
David J. Griffiths, **Introduction to Electrodynamics**, 4ª Edición,
D. K. Cheng, **Fundamentos de Electromagnetismo para Ingeniería**,
F. Dios, D. Artigas, et all., **Campos Electromagnéticos**,
J. R. Reitz, F. J. Milford, R. W. Christy, **Fundamentos de la Teoría Electromagnética**,
D. K. Cheng, **Field and Wave Electromagnetics**, 2ª Edición,
U. S. Inan, A. S. Inan, **Electromagnetic Waves**,
W. H. Hayt, J. A. Buck, **Teoría Electromagnética**, 7ª Edición,
W. H. Hayt, J. A. Buck, **Teoría Electromagnética**, 8ª Edición,
M. F. Iskander, **Electromagnetic Fields and Waves**, 2ª Edición,

All the required material (notes, exercises compilations, visualization tools in JAVA and Matlab, etc.) will be availabe in FAITIC.

Recommendations
Subjects that continue the syllabus
Electromagnetic Transmission/V05G300V01303

Subjects that are recommended to be taken simultaneously
Mathematics: Calculus II/V05G300V01203

Subjects that it is recommended to have taken before
Mathematics: Linear Algebra/V05G300V01104
Mathematics: Calculus I/V05G300V01105

IDENTIFYING DATA				
Mathematics: Calculus II				
Subject	Mathematics: Calculus II			
Code	V05G300V01203			
Study programme	(*)Grao en Enxeñaría de Tecnoloxías de Telecomunicación			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Basic education	1st	2nd
Teaching language	Spanish			
Department				
Coordinator	Martínez Varela, Áurea María			
Lecturers	Faro Rivas, Emilio García Lomba, Guillermo Martín Méndez, Alberto Lucio Martínez Varela, Áurea María Prieto Gómez, Cristina Magdalena			
E-mail	aurea@dma.uvigo.es			
Web	http://faitic.uvigo.es/			
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.			

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

Learning outcomes			
Expected results from this subject	Training and Learning Results		
Understanding the basic theory of integration of functions of one and several variables.	B3 B4	C1	D2 D3
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

Contents
Topic

Theme 1. Integral calculus in R.	The Riemann integral Integrable functions. The fundamental theorem of the integral calculus. The theorem of the half value. The rule of Barrow. Calculus of primitives: integration by parts and change of variable. Improper integrals.
Theme 2. Numerical integration.	Interpolatory quadratures. Properties. Error of interpolation. Particular cases: Poncelet, tapezoidal and Simpson formulas. Formulas of composite quadrature.
Theme 3. The multiple integral in the sense of Riemann.	The double and triple integrals in elementary regions. Change of the order of integration. Theorems of change of variable. Cylindrical and spherical coordinates. Applications.
Theme 4. Orthogonal functions and Fourier series.	Orthogonal functions. Fourier series. Developments of Fourier series for odd and even functions. Convergence. The Fourier transform.
Theme 5. Introduction to ordinary differential equations.	Differential equations. Generalities Concept of solution. Differential equations of first order. Existence and uniqueness of solution. Autonomous equations. Separate variables. Homogeneous equations. Exact equations. Linear equations. Families of curves and orthogonal paths.
Theme 6. Ordinary differential equations of second order.	Differential equations of second order and of upper order. Homogeneous and non homogeneous linear differential equations. Linear differential equations with constant coefficients. Indeterminate coefficients. Variation of parameters. Cauchy-Euler equation.
Theme 7. The Laplace transform.	Definition of the Laplace transform. Properties. Application to the solution of differential equations.

Planning

	Class hours	Hours outside the classroom	Total hours
Troubleshooting and / or exercises	17	17	34
Laboratory practises	3	6	9
Master Session	28	56	84
Troubleshooting and / or exercises	7	14	21
Practical tests, real task execution and / or simulated.	1	1	2

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

Methodologies

	Description
Troubleshooting and / or exercises	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 practises	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.
Master Session	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 attention

Methodologies	Description

Master Session	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 Faitic 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 the Web page of the department.
Troubleshooting and / or exercises	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 Faitic 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 the Web page of the department.
Laboratory practises	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 Faitic 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 the Web page of the department.

Assessment

	Description	Qualification	Training and Learning Results	
Troubleshooting and / or exercises	Five "one hour sessions". 1st session: Theme 1 (4th week aprox.) 2nd session: Theme 3 (8th week aprox.) 3rd session: Theme 4 (11th week aprox.) 4th session: Theme 5 (13th week aprox.) 5th session: Theme 6 (15th week aprox.) These five sessions account for 35% of the score with the following weights: First: 10% (1 point) Second: 10% (1 point) Third: 5% (0,5 points) Forth: 5% (0,5 points) Fifth: 5% (0,5 points) Final exam: 60% (6 points)	95	B3 B4	C1
Practical tests, real task execution and / or simulated.	The students will do a practice of laboratory of the Theme 2 using MATLAB or MAXIMA (8th week aprox.) Its value will be of 5% (0,5 points)	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 the first 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 assist to 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.

1. Continuous assessment.

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

N = C + E

C: Note obtained by adding the scores of the six sessions of the items 1, 2, 3, 4, 5 and 6.
E: Note of the final examination of the items 3, 5, 6 and 7.

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

2. Final evaluation of the semester.

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 **theywill pass the subject when the obtained score is greater than or equal to 5**.

3. Second chance.

Previously to the exam students who chose continuous assessment may choose, if desired, for an exam of the items 3, 5, 6 and 7. The final grade is obtained as

NR = C + ER

C: Note obtained by adding the scores of the six sessions of the items 1, 2, 3, 4, 5 and 6.
ER: Note the final recovery examination of the items 3, 5, 6 and 7.

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.

Sources of information

D. Zill & W.S. Wright, **Cálculo de una variable**, 4ª,
E. Marsden & A.J. Tromba, **Cálculo vectorial**, 5ª,
D.G. Zill & M.R. Cullen, **Ecuaciones diferenciales**, 3ª,
A. Quarteroni & F. Saleri, **Cálculo científico con Matlab y Octave**, 1ª,

Recommendations

Subjects that are recommended to be taken simultaneously

Physics: Analysis of Linear Circuits/V05G300V01201
Physics: Fields and Waves/V05G300V01202
Mathematics: Probability and Statistics/V05G300V01204

Subjects that it is recommended to have taken before

Mathematics: Linear Algebra/V05G300V01104
Mathematics: Calculus I/V05G300V01105

IDENTIFYING DATA				
Mathematics: Probability and Statistics				
Subject	Mathematics: Probability and Statistics			
Code	V05G300V01204			
Study programme	(*)Grao en Enxeñaría de Tecnoloxías de Telecomunicación			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Basic education	1st	2nd
Teaching language	Spanish			
Department				
Coordinator	Fernández Bernárdez, José Ramón			
Lecturers	Alonso Alonso, Ignacio Comesaña Alfaro, Pedro Curty Alonso, Marcos Fernández Bernárdez, José Ramón Mojón Ojea, Artemio Prol Rodríguez, Miguel			
E-mail	jramon.fernandez@uvigo.es			
Web	http://faitic.uvigo.es			
General description	In this subject we review some basic concepts of statistics, probability and random processes. These concepts are necessary in order to easily follow other subsequent subjects.			

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

Learning outcomes			
Expected results from this subject	Training and Learning Results		
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 RV. CDF and discrete RV. Transformation of continuous RV: 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. Two-dimensional transformations: fundamental theorem. Changes of dimension. Correlation and regression.
Estimation and limit theorems	Sample and population. Estimators. Estimation of mean and variance. Sequences of RV. Laws of the large numbers. Central limit theorem.
Stochastic processes	Description of a stochastic process. Statisticis of a stochastic process. Stationarity. Examples.

Planning

	Class hours	Hours outside the classroom	Total hours
Master Session	24	24	48
Troubleshooting and / or exercises	13.5	28	41.5
Practice in computer rooms	14	7	21
Troubleshooting and / or exercises	1	4	5
Multiple choice tests	0.5	2	2.5
Practical tests, real task execution and / or simulated.	0.5	2	2.5
Jobs and projects	0	6	6
Other	0.5	1	1.5
Long answer tests and development	2	20	22
*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.			

Methodologies

	Description
Master Session	The course is divided in five main topics. Each topic will have a theoretical part that will be exposed by the teacher in big group. The students will be required to perform a previous reading of the contents. Through this methodology the competencies CG3, CE1 and CT3 are developed.
Troubleshooting and / or exercises	Each topic will be complemented with problem resolution. The problems could be developed and solved in big or small group. The students will be required to work previously on these problems. Through this methodology the competencies CG3, CG4, CE1, CT2 and CT3 are developed.
Practice in computer rooms	Each topic will be completed with one or several sessions of computer practices. For this, a software developed by the teachers and specific questionnaires for each topic will be used. The 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 attention

Methodologies	**Description**
Master Session	Students will have the chance to attend tutorial sessions at the teacher´s office. Teachers will establish timetables for this purpose at the beginning of the course. This schedule will be published on the subject website.
Troubleshooting and / or exercises	Students will have the chance to attend tutorial sessions at the teacher´s office. Teachers will establish timetables for this purpose at the beginning of the course. This schedule will be published on the subject website.
Practice in computer rooms	Students will have the chance to attend tutorial sessions at the teacher´s office. Teachers will establish timetables for this purpose at the beginning of the course. This schedule will be published on the subject website.
Tests	**Description**

Jobs and projects	Students will have the chance to attend tutorial sessions at the teacher´s office. Teachers will establish timetables for this purpose at the beginning of the course. This schedule will be published on the subject website.

Assessment

	Description	Qualification	Training and Learning Results	
Troubleshooting and / or exercises	Twice the semester, students must solve a problem.	15	B3 B4	C1
Multiple choice tests	The students must answer a test.	10	B3 B4	C1
Practical tests, real task execution and / or simulated.	In group B class, students must solve an exercise. Students can be distributed in pairs. Each couple provides an unique exercise.	10	B3 B4	C1
Jobs and projects	The students, in groups of 3 or 4, should propose four test questions on a particular topic.	10	B4	C1
Other	At the end of a group B class, each student will correct a problem made by somebody else.	5	B3 B4	C1
Long answer tests and development	Final exam.	50	B3 B4	C1

Other comments on the Evaluation

Following the guidelines of the studies, two evaluation systems will be offered to the students inscribed on this subject: continuous evaluation and evaluation at the end of the semester.

The continuous evaluation consists of several tasks.

A student follows the continuous evaluation system if she/he participates in task 3 (approximately in the seventh week of the semester) or any later task. Tasks 1 and 2 may be performed without opting for the continuous evaluation.

Students who choose continuous evaluation:

Several tasks are evaluated. The approximate task calendar and the weight of each task in the final grade are listed below.

Task 1: Individual resolution of a problem. Weight 5%. Week 4

Task 2: Correction of the task 1 from somebody else. Weight 5%. Week 5

Task 3: Development of a test. This is done in groups of 4. Weight 10%. Week 7

Task 4: Individual resolution of a test. Weight 10%. Week 10

Task 5: Individual resolution of a problem. Weight 10%. Week 12

Task 6: Resolution of a problem by couples. Weight 10%. Week 14

The last task of the continuous evaluation will be a final exam. This will be a smaller version of the exam to be carried out by students who do not opt for continuous evaluation. The weight of the examination in the final grade will be 50 %

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

These tasks are not recoverable, what means that if a student cannot fulfill them in the stipulated period, teachers will not be committed to repeat them.

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

If a student has participated in continuous evaluation and does not pass the course he/she will receive a grade of fail, regardless of he/she takes the final exam or not.

The final grade for students who opt for continuous evaluation will be calculated as the average between the final exam and 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 obtained grade. Taking into account that tasks 1 and 2 are two parts of the same exercise, and that jointly weigh 10%, they will be considered as a whole for the purpose of excluding the worst mark.

Students who choose for evaluation at the end of the semester:

The possibility of a final examination will be provided to students who do not opt for the continuous evaluation. This exam will be rated between 0 and 10, and this will be the final grade obtained.

Second chance

Previously to the exam (or at its beginning), students will be asked to choose to be evaluated by continuous evaluation system (described before) or only by the final exam.

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

Sources of information
H. Stark y J.W. Woods, **Probability, Random Processes, and estimation theory for engineers**, 2,
X. Rong Li, **Probability, Random Signals and Statistics**, 1,
R. Cao y otros, **Introducción a la estadística y sus aplicaciones**, 1,
P. Peebles, **Principios de probabilidad, variables aleatorias y señales aleatorias**, 4,
A. Papoulis, **Probability, random variables and stochastic processes**, 4,
D. Peña, **Estadística, modelos y métodos. Tomo 1: Fundamentos**, 2,

- Notes of the course

- Questionnaires for laboratory

- They include the theoretical contents of the course.

- At the end of each chapter there is a set of problems belonging to any of the books listed in the bibliography and recommended readings. In general these problems are somewhat easier than those from bulletins.

Questionnaires for the laboratory include the statements and each practice problems and also some theoretical content. It is very important to read them in advance to carry out the practice.

Recommendations
Subjects that continue the syllabus
Data Communication/V05G300V01301
Computer Networks/V05G300V01403
Signal Transmission and Reception Techniques/V05G300V01404
Basics of bioengineering/V05G300V01915
Subjects that are recommended to be taken simultaneously
Mathematics: Calculus II/V05G300V01203
Subjects that it is recommended to have taken before
Mathematics: Linear Algebra/V05G300V01104
Mathematics: Calculus I/V05G300V01105

IDENTIFYING DATA				
Programming I				
Subject	Programming I			
Code	V05G300V01205			
Study programme	(*)Grao en Enxeñaría de Tecnoloxías de Telecomunicación			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Mandatory	1st	2nd
Teaching language	Spanish			
Department				
Coordinator	Rodríguez Hernández, Pedro Salvador			
Lecturers	García Palomares, Ubaldo Manuel Rodríguez Hernández, Pedro Salvador Santos Suárez, José Manuel			
E-mail	pedro.rodriguez@uvigo.es			
Web	http://faitic.uvigo.es			
General description	The aim of the course is to provide students with basic skills to program in a high level language.			

Competencies	
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. The algorithm and its different representations: flowchart, pseudocode, natural language. 2. Algorithm implementation by means of a programming language. Programming paradigms: modular programming and structured programming. 3. C language and the function main(). Source code and object code. The compiler and the interpreter. 4. Input/output exercises: human-computer interface. The standard input/output files: stdin, stdout. The #include directive. Library functions.
Lecture 2: Grammar and basic elements of C language.	1. The alphabet. Recursive derivations of sintactically valid sequences. Identifiers, numbers. Symbolic constants: The #define directive and macros. Use of the const qualifier. 2. Variables and their attributes: name, value, address, types. Pointer variables. Declaration of simple variables and pointers: the direction & and reference * operators. 3. The sizeof operator. Arithmetical operators. The assignment operator. Automatic type conversion and by means of the cast operator. 4. Syntactic notation for expressions and statements. Simple and compound statements.
Lecture 3: Sequential, iteration and selection statements	1. Evaluation of expressions with relational operators and boolean operators. 2. Decision statements: switch, if, nested if. The ternary operator (?:) 3. The iterative statements and their importance in modular programming: while, do while and for. The break and continue statements.
Lecture 4: Functions: Introduction	1. Pointer arithmetic. Arrays and pointers. Dynamic memory allocation to 1 and 2 dimension arrays: the malloc(), calloc(), realloc() functions. 2. Arrays of characters: The end of string character. Library functions for dealing with arrays of characters. 3. Functions declaration and definition. Local variables in a compound statement. Parameter passing by value and by reference: use of pointers. Function return. 4. Static variables and global variables.
Lecture 5: Functions: special cases	1. Command line arguments passing: argc and argv. 2. Recursive functions: advantages and disadvantages. 3. Creation and use of function libraries. The conditional directives in a header file. 4. Functions that return addresses.
Lecture 6: struct variables	1. struct variables: global declaration. Fields of a struct. Pointers to struct. The . (Point) and -> (arrow) operators. 2. struct and a pointer to struct as a funcion parameter and return value. 3. typedef with non trivial declarations. 4. More complex data structures: nested structs, array of structs. 5. Dynamic management in creating linear lists, circular lists and trees. 6. Insertion and removal of variables in a list.
Lecture 7: Files	1. Text files: fopen() and fclose() functions. 2. Different file input/output functions: fprintf (), fscanf(), fgets(), feof(). 3. Functions with direct access to files. 4. Information management between files and lists. 5. Node structure in simple linked lists. 6. File to list conversion and vice versa.

Planning

	Class hours	Hours outside the classroom	Total hours
Introductory activities	2	0	2
Master Session	24	24	48
Laboratory practises	12	16	28
Projects	8	24	32
Practical tests, real task execution and / or simulated.	5	15	20
Troubleshooting and / or exercises	5	15	20
*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.

Master Session	Plenary sessions that include the realisation of works and programs. Through this methodology the competencies CE12 and CT2 are developed.
Laboratory practises	During the first weeks of the term the student codifies, compiles and documents programs guided by the instructor. Some of these activities will be evaluated. Through this methodology the competencies CG4, CE12 and CT2 are developed.
Projects	In the last part of the term, the student must complete a low complexity project, under the instructor supervision, which includes individual and in group activities. Through this methodology the competencies CG4, CG9, CE6, CE12, CT2 and CT4 are developed.

Personalized attention

Methodologies	Description
Master Session	The webpage of the course informs on the prescheduled office hours that students can consult the instructors. This consulting will be devoted to answer the questions posed in the lectures, laboratory activities and the development of the project.
Laboratory practises	The webpage of the course informs on the prescheduled office hours that students can consult the instructors. This consulting will be devoted to answer the questions posed in the lectures, laboratory activities and the development of the project.
Projects	The webpage of the course informs on the prescheduled office hours that students can consult the instructors. This consulting will be devoted to answer the questions posed in the lectures, laboratory activities and the development of the project.

Assessment

	Description	Qualification	Training and Learning Results
Projects	The student will develop a project in the last weeks of the term, and will submit a report. The project will be assessed in the final laboratory test.	30	B4 C6 D4 B9 C12
Practical tests, real task execution and / or simulated.	Every 4 weeks, the student will take a practical individual test in the laboratory. At the end of the term, the student will take a comprehensive final practical test. All of them will consist in the development of a program in the computer. Those tests will assess the student's progress with the laboratory practices and with the project.	20	C6 C12
Troubleshooting and / or exercises	Every 4 weeks, the student will take a test that will assess the advancement of the students skill in the resolution of problems. At the end of the term, the student will take a comprehensive final test on the whole contents of the subject.	50	B4 C12

Other comments on the Evaluation

The **course planning in lectures** and the estimated time of the **most important assessment milestones** is detailed below:

- Week 1: Lecture 1/2
- Week 2: Lecture 3 - Practice 1
- Week 3: Lecture 3 - Practice 1/2
- Week 4: Lecture 4 - **Theory Test 1** (PT1) - **Laboratory Test 1** (PP1)
- Week 5: Lecture 4 - Practice 2/3
- Week 6: Lecture 4 - Practice 3/4
- Week 7: Lecture 5 - Practice 4/5
- Week 8: Lecture 5 - **Theory Test 2** (PT2) - **Laboratory Test 2** (PP2)
- Week 9: Lecture 5/6 - Practice 5/6
- Week 10: Lecture 6 - Practice 6 - Project (1h)
- Week 11: Lecture 6 - Project (2h)
- Week 12: Lecture 7 - Project (1h) - **Theory Test 3** (PT3) - **Laboratory Test 3** (PP3)
- Week 13: Lecture 7 - Project (2h)
- Week 14: Project (2h)

- Finals: **Final Theory Test** (PFT) - **Final Laboratory Test** (PFP)

In all courses the School offers two evaluation modes: **Continuous evaluation** and **comprehensive evaluation**.
The student must opt to the latter one explicitily, no latter than the week before the Theory Test 2 (PT2) is taken.
The **continuous evaluation** will be considered as "passed" if the student has submitted a report for the project developed from the 10th to the 14th week, and if the final grade obtained by the student is at least 5. This final grade is the harmonic mean between the theory and laboratory, calculated as follows:
NF = (2*NT*NP)/(NT+NP)
where:

- NP = 0.1*PP1+0.1*PP2+0.2*PP3+0.6*PFP
- NT = 0.1*PT1+0.1*PT2+0.2*PT3+0.6*PFT

The Final Theory Test (PFT) assesses the mastership of the contents explained in the lectures.
The Final Practice Test (PFP) assesses the proper application and coding in C to deal with a medium level project. Indirectly, it also assesses the mastership of the contents introduced in the lectures and the laboratory practices.
The use of the harmonic means implies that the course is not passed if either NP or NT has a grade under 3.3.
No test in the continuous evaluation mode 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.
In order to pass the course by the **comprehensive evaluation mode**, the student must submit a project report similar to the one submitted by the continuous evaluation students, and the final grade obtained by the student must be at least 5. This mode will consist of a theory test (PFT) and a laboratory test (PFP, which will include the evaluation of the project). The final grade is the harmonic mean between the theory and practice, calculated as follows:
NF = (2*NT*NP)/(NT+NP)
where:

- NP = PFP
- NT = PFT

Both the **continuous evaluation grade** and the **comprehensive evaluation grade** 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 the student opts for the continuous evaluation mode, when no test is taken after the Laboratory Test 1 (PP1)
- If the student opts for the comprehensive evaluation mode, when no final test (PFT and PFP) is taken.

University regulations allow students to take an additional test to approve the course (extra evaluation). In order to pass the course using this extra evaluation, the student must submit a project report similar to the one submitted by the continuous evaluation students, and the final grade obtained by the student must be at least 5. This extra evaluation will consist of a theory test and a laboratory test (which will include the evaluation of the project). The final grade is the harmonic mean between the theory and practice, calculated as follows:
NF = (2*NT*NP)/(NT+NP)
where:

- If the student takes the extra theory test, NT will be the grade achieved in that test. Otherwise, NT will be the theory grade obtained for the theoretical tests in his/her regular evaluation.
- If the student takes the extra laboratory test, NP will be the grade achieved in that test. Otherwise, NP will be the practice grade obtained for the practical tests in his/her regular evaluation.

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

If plagiarism is detected in any of the works/test taken, the student will receive a failing grade (0) and the professors will

report the fact to the school authorities.

Sources of information
Manuel Caeiro Rodríguez, Enrique Costa Montenegro, Ubaldo García Palomares, Cristina López Bravo, J, **Practicar Programación en C**, 2014,
Osvaldo Cairo Battistuti, **Fundamentos de Programación**, 2006,
José Rafael García-Bermejo Giner, **Programación Estructurada en C**, 2008,
Brian W. Kernighan & Dennis M. Ritchie, **El Lenguaje de Programación C**, 1986 (reimpreso en 1995),
James L. Antonakos & Kenneth C. Mansfield Jr., **Programación Estructurada en C**, 1997 (reimpreso en 2004),
Jorge A. Villalobos S. & Rubby Casallas G., **Fundamentos de Programación: Aprendizaje Activo Basado en Casos**, 2006,

Web resources

- http://www.Cprogramming.com
- José R. García-Bermejo Giner: http://maxus.fis.usal.es/FICHAS_C.WEB/11xx_PAGS/11xx.html

Recommendations

Subjects that continue the syllabus

Programming II/V05G300V01302

Subjects that it is recommended to have taken before

Informatics: Computer Architecture/V05G300V01103

Other comments

Programming II course continues this course in the second year.