



(*)Escola de Enxeñaría de Telecomunicación

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(*)E. T. S. Enx. Telecomunicación

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Toda a información relacionada coa Escola Técnica Superior de Enxeñaría de Telecomunicación da Universidade de Vigo así como das titulacións que se imparten, pódese atopar na páxina web do centro:

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(*)Grao en Enxeñaría de Tecnoloxías de Telecomunicación

Subjects

Year 1st

Code	Name	Quadmester	
V05G300V01101	Empresa: Fundamentos de empresa	1st	6
V05G300V01102	Física: Fundamentos de mecánica e termodinámica	1st	6
V05G300V01103	Informática: Arquitectura de ordenadores	1st	6

V05G300V01104	Matemáticas: Álgebra lineal	1st	6
V05G300V01105	Matemáticas: Cálculo I	1st	6
V05G300V01201	Física: Análise de circuitos lineais	2nd	6
V05G300V01202	Física: Campos e ondas	2nd	6
V05G300V01203	Matemáticas: Cálculo II	2nd	6
V05G300V01204	Matemáticas: Probabilidade e estadística	2nd	6
V05G300V01205	Programación I	2nd	6

Year 2nd

Code	Name	Quadmester	
V05G300V01301	Comunicación de datos	1st	6
V05G300V01302	Programación II	1st	6
V05G300V01303	Transmisión electromagnética	1st	6
V05G300V01304	Procesado dixital de sinais	1st	6
V05G300V01305	Física: Fundamentos de electrónica	1st	6
V05G300V01401	Tecnoloxía electrónica	2nd	6
V05G300V01402	Electrónica dixital	2nd	6
V05G300V01403	Redes de ordenadores	2nd	6
V05G300V01404	Técnicas de transmisión e recepción de sinais	2nd	6
V05G300V01405	Fundamentos de son e imaxe	2nd	6

IDENTIFYING DATA				
(*)Empresa: Fundamentos de empresa				
Subject	(*)Empresa: Fundamentos de empresa			
Code	V05G300V01101			
Study programme	(*)Grao en Enxeñaría de Tecnoloxías de Telecomunicación			
Descriptors	Credit. 6	Type Basic education	Year 1st	Quadmester 1st
Language	(*)Castelán			
Department				
Coordinador	Gonzalez Vazquez, Beatriz			
Lecturers	Alvarez Llorente, Gema Fernández Bahamonde, Paula Gonzalez Vazquez, Beatriz Pena Lago, Paula			
E-mail	bgonza@uvigo.es			
Web	http://fatic.uvigo.es			
General description	(*)Following the own guidelines of the *titulación will offer to the students that *cursen this *materiados systems of evaluation: continuous evaluation and evaluation at the end of the *cuatrimestre.			

Competencies

Code	
A4	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.
A8	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.
A14	The necessary knowledge of business concepts, of law and institutional frameworks. business organization and management

Learning aims

	Typology	Competences
(*)Suitable knowledge of the concept of company, institutional and law frame of the company. Organisation and management of companies.	know	A14
(*)Capacity to resolve problems with initiative, for the taking of decisions, the creativity, know and to communicate and transmit knowledges, skills and skills, comprising the ethical and professional responsibility of the activity of the Technical Engineer of Telecommunication		A4
(*)Know and apply basic elements of economy and of management of human resources, Know How organisation and planning of projects, as well as of legislation, regulation and normalisation in the telecommunications.		A8

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 Function of production. 3.2 Classification of the productive processes. 3.3 The economic programming of the production. 3.4 The productivity: indicators of productivity. 3.5 Research, development and technological innovation.
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 The human system. 6.3 The cultural system. 6.4 The political system
	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: Market and company

Planning

	Class hours	Hours outside the classroom	Hores totals
(*)Sesión maxistral	25	58	83
(*) Prácticas de laboratorio	24	36	60
(*) Probas de tipo test	4	0	4
(*)Probas de resposta longa, de desenvolvemento	3	0	3

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

Methodologies

	Description
(*)Sesión maxistral	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.
(*) Prácticas de laboratorio	(*)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.

Personalized attention

	Description
(*)Sesión maxistral	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 Fatic.

(*) Prácticas de laboratorio 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 magistrales 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
(*) Prácticas de laboratorio	(*)Resolution of problems, practical exercises and realisation of activities in which will apply the theoretical knowledges purchased to concrete situations related with the matter.	0
(*)Probas de resposta longa, de desenvolvimento	(*)Final proof that can contain partial or totally the contents of the matter developed in the classes of theory and of practices.	70
(*) Probas de tipo test	(*)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.	30

Other comments and second call

Following the own guidelines of the degree will offer two systems of evaluation: continuous evaluation and evaluation at the end of the semester.

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. The proofs will consist so much in the realisation of the practices of the matter, as in three proofs evaluables, that will effect roughly around the middle of October, November and 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 20%, and the second and third proof 30% and 50%, respectively.

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 2/3 of the proofs realised -being one of them the last proof-, obtain an average in the qualification of 5 and have approved 70% of the practices of the subject.

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 70% of the note that will add to the note obtained in the continuous evaluation (30% remaining).

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 (July)

For the announcement of recovery (July) the student that did not approve the subject chooses (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, Pirámide

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

Pérez Gorostegui, E. , Curso de introducción a la economía de la empresa, 2009, Editorial Universitaria Ramón Areces

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

(*)

Complementary

It gladden *y *otros (2000): “*Fundamentos of economy of wool company: functional perspective”, *Ariel Economy*.

*Barroso Castrate *C. (*coord.) (1996): “Cases *y question of economy of wool company”, *Pyramid*.

*Bueno Fields, And. (2007): “Organization of companies: *estructuras, processes *y models”, *Pyramid*.

*Bueno Fields, And. *y *otros (2000): “Economy of wool company. *Análisis Of wools *decisiones *empresariales”, *Pyramid*.

*Casanueva Rock, *C. (2002): “*Fundamentos of *gestión business”, *Pyramid*.

*Díez Of Castrate *y *otros (2002): “*Introducción the wool economy of wool company *I *y II”, *Pyramid*.

*Laborda *Castillo, *L. *y Rafael of *Zuani, And. (2005): “*Introducción the wool *gestión business: *fundamentos theoretical *y *aplicaciones, *Universidad of *Alcalá of *Henares.

López, F. (2009): “Wool company explained of form *sencilla”, *Books of *Cabecera *S.*L. Of Books*.

*Luque Of wool Tower, *M.IT. *y *otros (2001): “practical Course of economy of wool company. An approach of organization”, *Pyramid*.

García Of @el *Junco *J. (*coord) *y *otros (2001): “Practices of *gestión business”, *McGrawHill*.

VV.AA. (2003): “*Introducción the wool economy *y administration of companies”, *Pyramid*.

VV.AA. (2006): “practical Aspects of wool *gestión of companies”, *Universitas International*.

VV.AA. (2007): “Problems of economy of wool company”, *Pyramid*.

Recommendations

IDENTIFYING DATA**(*)Física: Fundamentos de mecánica e termodinámica**

Subject	(*)Física: Fundamentos de mecánica e termodinámica			
Code	V05G300V01102			
Study programme	(*)Grao en Enxeñaría de Tecnoloxías de Telecomunicación			
Descriptors	Credit.	Type	Year	Quadmester
	6	Basic education	1st	1st
Language	(*)Castelán			
Department				
Coordinador	Chiussi , Stefano Fernandez Doval, Angel Manuel			
Lecturers	Chiussi , Stefano Fernandez Doval, Angel Manuel Fernandez Fernandez, Jose Luis			
E-mail	schiussi@uvigo.es adoval@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	
A3	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
A5	The knowledge to perform measurements, calculations, assessments, appraisals, technical evaluations, studies, reports, task scheduling and similar work to each specific telecommunication area.
A6	The aptitude to manage mandatory specifications, procedures and laws.
A12	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.

Learning aims

	Typology	Competences
Understanding and mastering of the basic concepts on the general laws of Mechanics and Thermodynamics as well as of their application to solving problems in engineering.	know Know How	A12
Knowledge of fundamental and technological subjects which enable the students to learn new methods and technologies, as well as to endue them with versatility to get adapted to new situations.	know Know How	A3
Knowledge to perform measurements, calculations, assessments, valuations, expert's reports, surveys, reports, task planning and other similar labours into their specific scope of Telecommunications.	Know How	A5
Skilfulness to handle specifications, regulations and legally binding standards.	Know How	A6

Contents

Topic	
1.- Physical magnitudes and units. The International System.	(*)
2.- Vectorial tools for Mechanics.	(*)
3.- Point Kinematics.	(*)
4.- Point Kinetics.	(*)
5.- Point 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	Hores totals
(*)Sesión maxistral	22	22	44
(*)Estudo de casos/análises de situacións	6	12	18
(*) Resolución de problemas e/ou exercicios	15.5	46.5	62
(*) Prácticas de laboratorio	9	13.5	22.5
(*) Probas de tipo test	0.5	0	0.5
(*)Probas de resposta curta	1	0	1
(*)Probas prácticas, de execución de tarefas reais e/ou simuladas.	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
(*)Sesión maxistral	<p>Prior personal work:</p> <ul style="list-style-type: none"> -Preliminary reading of the proposed bibliography on the subject. <p>During the lectures:</p> <ul style="list-style-type: none"> -Presentation of theoretical concepts. -Experimental demonstrations. -Audiovisual presentations. <p>Ulterior personal work:</p> <ul style="list-style-type: none"> -Revision of theoretical concepts. -Weak-point identification. -Consult the bibliography.
(*)Estudo de casos/análises de situacións	<p>Application of the theoretical concepts to simple cases and situations.</p> <p>During the lectures:</p> <ul style="list-style-type: none"> -Solving of examples. <p>Ulterior personal work:</p> <ul style="list-style-type: none"> -Solving of cases and situations from the bibliography. -Identification of weak points which require tutorial aid.
(*) Resolución de problemas e/ou exercicios	<p>Solving of average-difficulty problems involving one or more theoretical concepts.</p> <p>During the lectures:</p> <ul style="list-style-type: none"> -Presentation of solving strategies and techniques by solving example-problems. <p>Personal work:</p> <ul style="list-style-type: none"> -Solving of problems from the bibliography. -Identification of weak points which require tutorial aid.

(*) Prácticas de laboratorio

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.

Personalized attention

Description

(*) Sesión maxistral

- 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.

(*) Estudio de casos/análisis de situaciones

- 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.

(*) Resolución de problemas e/ou ejercicios

- 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.

(*) Prácticas de laboratorio

- 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
(*) Probas de tipo test	Multiple-choice questions about theoretical concepts. Solving of elementary cases and situations related to the topics in both the classroom and laboratory syllabi.	25
(*)Probas de resposta curta	Short answer questions about theoretical concepts. Solving of elementary cases and situations related to the topics in both the classroom and laboratory syllabi.	25
(*)Probas prácticas, de execución de tarefas reais e/ou simuladas.	Practical tests: Solving of problems involving one or more theoretical topics. Execution of real and simulated measurements. Real- and simulated-measurement result processing.	50

Other comments and second call

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 Problems and Experiments schedule of the subject which will be published at the beginning of the semester.

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 Problems and Experiments schedule of the subject which will be published at the beginning of the semester.

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 Problems and Experiments schedule of the subject which will be published at the beginning of the semester.

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)

$$\text{overall mark} = g2$$

3) JULY 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 July 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)

$$\text{overall mark} = \min\{ 10, g3A \}$$

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, 12, Addison-Wesley

I.N. Bronshtein, K.A. Semendiaev, Manual de Matemáticas para Ingenieros y Estudiantes, 1, MIR

Recommendations**Subjects that continue the syllabus**

(*)Fundamentos de son e imaxe/V05G300V01405

Subjects that are recommended to be taken simultaneously

(*)Matemáticas: Álgebra lineal/V05G300V01104

(*)Matemáticas: Cálculo 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				
(*)Informática: Arquitectura de ordenadores				
Subject	(*)Informática: Arquitectura de ordenadores			
Code	V05G300V01103			
Study programme	(*)Grao en Enxeñaría de Tecnoloxías de Telecomunicación			
Descriptors	Credit. 6	Type Basic education	Year 1st	Quadmester 1st
Language	(*)Castelán			
Department				
Coordinador	Llamas Nistal, Martin			
Lecturers	Alvarez Sabucedo, Luis Modesto Gil Solla, Alberto Llamas Nistal, Martin Lopez Nores, Martin Santos Gago, Juan Manuel			
E-mail	martin@uvigo.es			
Web	http://faitic.uvigo.es			
General description	(*)The computer has turned into an indispensable tool. This does more evident in the studies of Degree in Engineering of Technologies of Telecommunication, where no longer is only necessary like user, and in a lot of cases like skilled user, but like tool object of design or part intimately tied of other systems that the engineer has to design. Therefore, the main motivation of the *asignatura Architecture of Computers is to provide the necessary knowledges to understand the operation of the computer centring in the levels of abstraction lower but without arriving to the *circuitería electronic. The *asignatura of Architecture of Computers centre in the level of conventional machine, enters the level of operative machine and presents an example of application in the level of symbolic machine through the presentation of the Systems of Management of Databases.			

Competencies	
Code	
A3	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
A4	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.
A9	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
A11	The basic knowledge about using and programming computers, operative systems, databases and Engineering applied software.

Learning aims		
	Typology	Competences
(*)FB2: Conocimientos básicos sobre el uso y programación de los ordenadores, sistemas operativos, bases de datos y programas informáticos con aplicación en ingeniería.	know	A11
(*)CG3: Conocimientos de materias básicas y tecnologías, que le capacite para el aprendizaje de nuevos métodos, y tecnologías, así como que le dote de una gran versatilidad para adaptarse a nuevas situaciones.	know	A3
(*)CG4: Capacidad de resolver problemas con iniciativa, toma de decisiones, creatividad, y de comunicar y transmitir conocimientos, habilidades y destrezas, comprendiendo la responsabilidad ética y profesional de la actividad del Ingeniero Técnico de Telecomunicación	know	A4
(*)CG9: Capacidad de trabajar en un grupo multidisciplinar y en un entorno multilingüe y de comunicar, tanto por escrito como de forma oral, conocimientos, procedimientos, resultados e ideas relacionadas con las telecomunicaciones y la electrónica.	know	A9

Contents	
Topic	
(*)Tema I: PRELIMINARES	(*)Representación de la información en los ordenadores. Modelo de Von Neumann. Modelos estructural, procesal y funcional.
(*)2. Modelo von Neumann	(*)Componentes de la máquina von Neumann. Máquina Sencilla: Simplex. Unidad central de proceso, unidad aritmético-lógica, memorias, registros, buses. Introducción a los direccionamientos. Máquina Extendida: Simplex+i4
(*)3. Representación y procesamiento simbólico.	(*)Representación de los tipos elementales de datos: enteros, caracteres, números en coma flotante. Convenios sobre el orden de almacenamiento en memoria. Operaciones de procesamiento. Introducción al procesamiento simbólico. Lenguaje ensamblador.
(*)4. Instrucciones y direccionamientos	(*)4. Instrucciones y direccionamientos Consideraciones sobre el software. Registros en el nivel de máquina convencional. Lenguaje de transferencia entre registros (nivel RT). Formatos de instrucciones. Modos de direccionamiento. Pilas y subprogramas. Lenguajes ensambladores.
(*)5. Máquina convencional típica	(*)Modelo estructural. Modelo funcional. Repertorio de instrucciones. Modos de direccionamiento. Ensamblador. Ejemplo de programas. ALGORITMEZ
(*)6. Gestión de la Periferia	(*)Tipos de periféricos. Tratamiento de la variedad. Modelos. Memorias secundarias. Interrupciones. Rutinas de servicio. ADM: justificación.
(*)7. Sistemas Operativos	(*)Máquina operativa. Introducción a los Sistemas Operativos. Definición de un Sistema Operativo. Interfaz de un Sistema Operativo. Introducción a la gestión de la CPU. Introducción a la gestión de memoria. Introducción a la gestión de ficheros. Introducción a la gestión de entrada/salida (E/S).
(*)8. Bases de Datos	(*)Introducción a las Bases de Datos. Modelo Relacional. Modelo Entidad Relación. Lenguajes de consulta. Introducción a SQL.

Planning			
	Class hours	Hours outside the classroom	Hores totals
(*) Prácticas de laboratorio	22	27.5	49.5
(*)Actividades introductorias	5	5	10
(*) Resolución de problemas e/ou ejercicios	10	17.5	27.5
(*)Sesión maxistral	12	24	36
(*)Probas de autoavaliación	0	3	3
(*)Probas prácticas, de ejecución de tarefas reais e/ou simuladas.	4	8	12
(*)Probas de resposta curta	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
(*) Prácticas de laboratorio	(*)In him laboratory will realize practical of programming of a @ordenador *sencillo (*SIMPLEZ) *y of a normal computer (*ALGORITMEZ)
(*)Actividades introductorias	(*)Exhibition of @el program of wool *asignatura, *metodologías *empleadas, schedules of *tutoría, *evaluación, *funcionamiento of @el laboratory,*y all *aqueellos aspects related with wool *asignatura.
(*) Resolución de problemas e/ou ejercicios	(*)Will resolve problems *y *ejercicios so much of programming how of representation of information, *etc.*Algunos Previously will be realized home by *los students, *y in *algunos will take part actively in *su resolution.
(*)Sesión maxistral	(*)They will expose in class the theoretical subjects and his practical application. It will try that the student take part *intercalando the resolution of exercises, of such *fomra that in each session of classes there are sessions *magistrales or resolution of problems and exercises.

Personalized attention	
	Description

(*) Sesión magistral	(*) During the sessions *magistrales, the classes of resolution of problems and exercises and the practices of laboratory, the professor will employ educational methods that allow him attend personally to the students. This joined to the proofs of attention that will do during these classes, will allow to the professor have a follow-up *personalizado of the student. In the hours of *tutoría will resolve all the doubts related with the practices, resolution of problems and sessions *magistrales. By means of the Continuous Evaluation will treat to identify the students that go worse, to call them to *tutoría and see what is what has carried him to have these bad results, and the research and solutions.
(*) Resolución de problemas e/ou ejercicios	(*) During the sessions *magistrales, the classes of resolution of problems and exercises and the practices of laboratory, the professor will employ educational methods that allow him attend personally to the students. This joined to the proofs of attention that will do during these classes, will allow to the professor have a follow-up *personalizado of the student. In the hours of *tutoría will resolve all the doubts related with the practices, resolution of problems and sessions *magistrales. By means of the Continuous Evaluation will treat to identify the students that go worse, to call them to *tutoría and see what is what has carried him to have these bad results, and the research and solutions.
(*) Prácticas de laboratorio	(*) During the sessions *magistrales, the classes of resolution of problems and exercises and the practices of laboratory, the professor will employ educational methods that allow him attend personally to the students. This joined to the proofs of attention that will do during these classes, will allow to the professor have a follow-up *personalizado of the student. In the hours of *tutoría will resolve all the doubts related with the practices, resolution of problems and sessions *magistrales. By means of the Continuous Evaluation will treat to identify the students that go worse, to call them to *tutoría and see what is what has carried him to have these bad results, and the research and solutions.

Assessment		
	Description	Qualification
(*) Probas de autoevaluación	(*) *dejarán Questions of *examen of *otras announcements so that *puedan *autoevaluarse.	0
(*) Probas prácticas, de ejecución de tarefas reais e/ou simuladas.	(*) Will realize of the *ejercicios practical in him laboratory	50
(*) Probas de resposta curta	(*)(*) They will realise in theory 3 *exercices of *continuous evaluation, with a total weight of theory of 50%	50

Other comments and second call

(*)

Wool *asignatura divides in of the parts: Theory (5 points) *y Practical (5 points). To approve wool *asignatura *hay that approve wool theory *y practical wool, are *decir, *tener join note *mayor the equal that 2,5 in Theory *y in Practical (wools notes are on 5).

*Sea NT wool Note of Theory *y NP wool of Practice. To approve wool *asignatura *tiene that NT \geq 2,5 *y NP \geq 2,5, *y *entonces wool Note of wool *Asignatura NA are NT+NP.

Yes NT

Sources of information

Gregorio Fernández Fernández, Curso de Ordenadores. Conceptos básicos de arquitectura y sistemas operativos., 5ª, Servicio de Publicaciones de la E.T.S.I. Telecomun

Silberschatz, H.F. Horth y S. Sudarshan, Fundamentos de Bases de Datos. , 2ª, McGraw-Hill. 2002

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

J.L. Hennessy y D.A. Patterson, Arquitectura de los Computadores. Un enfoque cuantitativo, , McGraw-Hill. 1993

Alberto Gil Solla, Ejercicios resueltos sobre Fundamentos de los Ordenadores, 1ª, Editorial Andavira, 2009

Alberto Gil Solla, Problemas resueltos de programación en ensamblador, 1ª, Editorial Andavira, 2009

(*)

ADDITIONAL BIBLIOGRAPHY:

[With the98] *C. *Costilla Rodríguez. 1996. *Introducción The wools Bases of Modern Data. *Dpto. *Publicaciones *ETSIT Madrid. *ISBN 84-605-6469-*X

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

[*Dat01] *C.*J. It date. 2001. *Introducción To *los Systems of Bases of Data. *Pearson Education. *ISBN : 968-444-419-2

- [EN02] R.IT. *Elmasri *and *S.*B. *Navathe. 2002. *Fundamentos Of Systems of Bases of Data. *Pearson Education. *ISBN 978-84-782-9085-7
- [*FMH01] *I.*M. *Flynn *y IT. *McIver *McHoes. 2001. Operative systems (*tercera edition) . *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. Organization of *Computadoras (2ª *ed.) *McGraw-Hill.
- [PH95] *D. IT. Patterson *y *J.*L. *Hennessy (Translated by *J.*M. *Sánchez), 1995. Organization *y *diseño of Computers. Wool *interfaz hardware/software. *McGraw-Hill. 1-55860-281-*X.
- [SBG02] IT. *Silberschatz, *P. *Baer *Galvin, *G. *Gagne. 2002. Operative systems (sixth edition). *Limusa-Wiley. *ISBN: 9681858220

Recommendations

IDENTIFYING DATA				
(*)Matemáticas: Álgebra lineal				
Subject	(*)Matemáticas: Álgebra lineal			
Code	V05G300V01104			
Study programme	(*)Grao en Enxeñaría de Tecnoloxías de Telecomunicación			
Descriptors	Credit.	Type	Year	Quadmester
	6	Basic education	1st	1st
Language	(*)Castelán			
Department				
Coordinador	Martín Mendez, Alberto Lucio			
Lecturers	Martín Mendez, Alberto Lucio			
E-mail	amartin@dma.uvigo.es			
Web	http://fatic.uvigo.es/			
General description	(*)The matter Linear Algebra *imparte in the first *cuatrimestre of the first course of the Degree in Engineering of Technologies of Telecommunication, with the main aim to endow to the student of a correct handle of the elementary mathematical symbolism, of the basic technicians of the matrix calculation and of an initiation to the methods of resolution of problems that serve of base for *asignaturas to *cursar later. It will loan special attention to the applications of the Linear Algebra, as well as to the part of the Numerical Analysis that concerns to the *asignatura.			

Competencies	
Code	
A3	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
A4	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.
A10	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

Learning aims		
	Typology	Competences
(*)	Know How	A10
(*)	know	A3
(*)CG4 Capacidad para resolver problemas. CG4.1 Capacidad para resolver problemas con iniciativa, toma de decisionedecreatividad. CG4.2 Capacidad de comunicar y transmitir conocimientos, habilidades y destreza.	Know How	A4

Contents	
Topic	
(*)Tema 1. Los números complejos.	(*)
(*)Tema 3. Espacios vectoriales.	(*)Estructura de espacio vectorial. Subespacio. Sistema de generadores. Subespacio suma. Dependencia e independencia lineal. Base. Dimensión.
(*)Tema 4. Matrices y determinantes.	(*)Operaciones con matrices. Tipos particulares de matrices. Traza. Submatrices. Matrices por bloques. Equivalencia, semejanza y congruencia. Rango. Determinantes. Matrices elementales. Método de Gauss. Aplicación lineal. Núcleo e imagen.
(*)Tema 5. Sistemas de ecuaciones lineales.	(*)Sistema de ecuaciones lineales. Resolución de un sistema de ecuaciones lineales. Factorización LU.

(*)Tema 6. Autovalores y autovectores.

(*)Autovalores y autovectores. Subespacio propio.

(*)Tema 7. Teorías de diagonalización

(*)Diagonalización por semejanza. Teorema de Cayley-Hamilton. Producto escalar. Producto hermítico. Norma. Ortogonalidad y ortonormalidad. Localización de autovalores. Diagonalización unitaria. Factorización de Cholesky.

Planning

	Class hours	Hours outside the classroom	Hores totals
(*) Prácticas de laboratorio	2	2	4
(*)Sesión maxistral	38	76	114
(*) Resolución de problemas e/ou ejercicios	9	9	18
(*)Resolución de problemas e/ou ejercicios	5	5	10
(*)Probos de resposta longa, de desenvolvimento	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
(*) Prácticas de laboratorio	(*)Use of the computer tool *MATLAB for the employment of the basic instructions of the matrix calculation.
(*)Sesión maxistral	(*)Explanation and development by part of the professor of the contents of the diverse subjects that compose the *temario.
(*) Resolución de problemas e/ou ejercicios	(*)Resolution by part of the professor of suitable exercises to each subject and suitable exercises to put of self-evident the relations of the subjects between himself. The student will have to also take part in the resolution of exercises with the end of *afianzar his knowledges.

Personalized attention

	Description
(*) Resolución de problemas e/ou ejercicios	(*)The students will have occasion of *acudir to *tutorías *personalizadas 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 *asignatura. The professor will attend personally to the students with the end to clear the doubts that can have about the contents of the matter or of the exercises resolved. Also it will attend personally to the students that have doubts about exercises looked for by them same.
(*) Prácticas de laboratorio	(*)The students will have occasion of *acudir to *tutorías *personalizadas 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 *asignatura. The professor will attend personally to the students with the end to clear the doubts that can have about the contents of the matter or of the exercises resolved. Also it will attend personally to the students that have doubts about exercises looked for by them same.
(*)Sesión maxistral	(*)The students will have occasion of *acudir to *tutorías *personalizadas 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 *asignatura. The professor will attend personally to the students with the end to clear the doubts that can have about the contents of the matter or of the exercises resolved. Also it will attend personally to the students that have doubts about exercises looked for by them same.
(*)Resolución de problemas e/ou ejercicios	(*)The students will have occasion of *acudir to *tutorías *personalizadas 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 *asignatura. The professor will attend personally to the students with the end to clear the doubts that can have about the contents of the matter or of the exercises resolved. Also it will attend personally to the students that have doubts about exercises looked for by them same.

Assessment

Description	Qualification
-------------	---------------

(*)Resolución de problemas e/ou ejercicios	(*)Following the own guidelines of the *titulación will offer two systems of evaluation: 50 continuous evaluation and evaluation at the end of the *cuatrimestre. In the case of the continuous evaluation the planning will be of the following form: Five proofs of an hour: 1. Individual proof of the subjects 1 and 2 (10%; week of the 26-*sep). 2. Proof by groups of 4 or 5 students of the subjects 3 and 4 (10%; week of the 7-*nov). 3. Individual proof of the subject 5 (10%; week of the 28-*nov). 4. Delivery and resolution, so much by groups of 4 or 5 people and individual, of an exercise on symbolic calculation with scalar, vectors, matrices, *determinantes, *autovalores, *autovectores, scalar product, norm, etc (10%; week of the 12-*dic). 5. Proof by groups of 4 or 5 students of the subject 6 (10%; week of the 19-*dic).	
(*)Probas de resposta longa, de desenvolvemento	(*)An individual proof of two hours of the subjects 1, 2, 3, 4, 5 and 6 .	50

Other comments and second call

(*)

(*)

Continuous evaluation:

It will consider that a student opted by the continuous evaluation when, @logo to know the qualification that obtain in the first individual proof of an hour, accept to take part in the *elaboración of the groups of work. In this case, the final qualification of a student obtains by means of the formula

$$*N = (5/10) *x *T + (5/10) *x \text{ And}$$

Where *T is the note, between 0 and 10, obtained how the average *ponderada of the notes of the five proofs of an hour and where And is the note, between 0 and 10, of the proof of two hours. In this *modalidade a student will be approved when *N was main or the same that 5. Before the realization or delivery of each task will indicate the date and procedure of review of the qualifications obtained, that will be public in a reasonable term of time. The proofs are not recoverable, is to say, yes a student can not present to realize them in the day stipulated pole professor, this does not have obligation to repeat him them.

The qualification obtained in the tasks *evaluables will be valid so alone stop the academic course in the that realize .

Evaluation at the end of the *cuatrimestre:

The students that do not opt to follow the continuous evaluation #be able to present it a @exame, that will not be necessarily the same that the individual proof of two hours of the subjects 1, 2, 3, 4, 5 and 6 of the students that follow the continuous evaluation, where will be *evaluados on 10 points. In this *modalidade a student will be approved when the qualification of the @exame was main or the same that 5.

Recovery in the month of July:

The day of the @exame of recovery, the students that chose continuous evaluation will be able to opt, yes wish it and before seeing it, it a @exame where the note obtains how

$$NR = (5/10) *x *T + (5/10) *x *D$$

Where *T is the note, between 0 and 10, obtained how the average *ponderada of the notes of the five proofs of an hour and *D is the note, between 0 and 10, obtained in a @exame of three hours of maximum length of the subjects 1, 2, 3, 4, 5 and 6. In this *modalidade a student will be approved when NR was main or the same that 5.

In case of not choosing this option, or of no power do it by not taking part in the continuous evaluation, the @exame of recovery, that will not be necessarily the same that what have to realize the students that yes choose dictate option, will be also of the subjects 1, 2, 3, 4, 5, and 6 and of three hours of maximum length. In this case the @exame will be *evaluado between 0 and 10 and a student will be approved when the qualification of the @exame was main or the same that 5.

Qualification of no presented:

A student will consider no presented yes does not opt by the continuous evaluation and how maximum presents to the first individual proof of an hour. In contrary case will consider presented and will award him the note that correspond him.

Sources of information

D. C. Lay, Álgebra lineal y sus aplicaciones, 3ª, Pearson Education (2007)

D. Poole, Álgebra lineal: Una introducción moderna, 2º, Thomson (2007)

L. Merino; E. Santos, Álgebra lineal con métodos elementales, 1ª, Thomson (2006)

Recommendations

Subjects that continue the syllabus

(*)Física: Análise de circuitos lineais/V05G300V01201

(*)Matemáticas: Cálculo II/V05G300V01203

Subjects that are recommended to be taken simultaneously

(*)Matemáticas: Cálculo I/V05G300V01105

IDENTIFYING DATA				
(*)Matemáticas: Cálculo I				
Subject	(*)Matemáticas: Cálculo I			
Code	V05G300V01105			
Study programme	(*)Grao en Enxeñaría de Tecnoloxías de Telecomunicación			
Descriptors	Credit.	Type	Year	Quadmester
	6	Basic education	1st	1st
Language	(*)Castelán			
Department				
Coordinador	Calvo Ruibal, Natividad			
Lecturers	Calvo Ruibal, Natividad García Lomba, Guillermo Gonzalez Rodriguez, Ramon Prieto Gomez, Cristina Magdalena			
E-mail	nati@dma.uvigo.es			
Web	http://fatic.uvigo.es			
General description	(*)The aim that pursue with this *asignatura 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 *asignatura expect 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	
A3	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
A4	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.
A10	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

Learning aims		
	Typology	Competences
(*)	Know How	A10
(*)	Know How	A4
(*)	know	A3

Contents	
Topic	
(*)Tema 1. Introducción.	(*)Conjuntos de números. Valor absoluto y propiedades.
(*)Tema 2. Continuidad de funciones de una variable.	(*)Límite de una función en un punto. Límites laterales. Continuidad. Teorema del valor intermedio. Teorema de Bolzano. Método de bisección.
(*)Tema 3. Derivación de funciones de una variable.	(*)Derivada de una función en un punto. Función derivada, derivadas sucesivas, propiedades. Regla de la cadena. Derivación de funciones inversas.
(*)Tema 4. Aplicaciones de la derivada.	(*)Máximos y mínimos. Teorema del valor medio. Regla de L'Hopital. Polinomio de Taylor. Estudio local de la gráfica de una función. Método de Newton.

(*)Tema 5. Vectores en \mathbb{R}^n .	(*)Producto escalar, norma, puntos notables. Producto vectorial. Coordenadas polares, cilíndricas, esféricas.
(*)Tema 6. Continuidad de funciones de varias variables.	(*)Funciones de varias variables. Límites. Continuidad.
(*)Tema 7. Diferenciabilidad de funciones de varias variables.	(*)Derivada direccional y derivadas parciales. Diferenciabilidad. Regla de la cadena. Derivadas de orden superior. Operadores diferenciales.
(*)Tema 8. Aplicaciones el cálculo diferencial.	(*)Polinomio de Taylor. Extremos relativos. Extremos condicionados. Método de Newton.

Planning

	Class hours	Hours outside the classroom	Hores totals
(*)Sesión maxistral	38	66.5	104.5
(*) Resolución de problemas e/ou ejercicios	10	14	24
(*) Prácticas de laboratorio	2	1.5	3.5
(*)Resolución de problemas e/ou ejercicios	4	8	12
(*)Resolución de problemas e/ou ejercicios	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
(*)Sesión maxistral	(*)The professor will expose the theoretical contents of the matter.
(*) Resolución de problemas e/ou ejercicios	(*)They will resolve problems and exercises of each one of the subjects and the student will have to resolve similar exercises.
(*) Prácticas de laboratorio	(*)They will use computer tools (*Maxima and/or *Matlab) to resolve exercises and apply the knowledges purchased in the theoretical classes.

Personalized attention

	Description
(*)Sesión maxistral	(*)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 *acudir to *tutorías *personalizadas 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 *asignatura.
(*) Resolución de problemas e/ou ejercicios	(*)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 *acudir to *tutorías *personalizadas 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 *asignatura.
(*) Prácticas de laboratorio	(*)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 *acudir to *tutorías *personalizadas 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 *asignatura.

Assessment

	Description	Qualification
(*)Resolución de problemas e/ou ejercicios	(*) - First session (1 hour): Subjects 1 and 2. (Week: 3 of October).-Second session (1 hour): Subjects 3 and 4. (Week: 31 of October).-Third session (1 hour): Subjects 5 and 6. (Week: 21 of November).- Fourth session (1 hour): Subject 7. (Week: 19 of December).The four previous sessions add 40% of the total note. The punctuation of each one of them will be of 10%.	40
(*)Resolución de problemas e/ou ejercicios	(*)Final examination on the subjects 3, 4, 6, 7 and 8 of the matter. His punctuation will be 60% of the total note.	60

Other comments and second call

(*)

Seguindo las directrices propias de la titulación se ofrecerán dos sistemas de evaluación: evaluación continua y evaluación al final del cuatrimestre.

1. Evaluación continua

Se considerará que un alumno ha optado por evaluación continua cuando, tras haberse presentado a la primera sesión de evaluación continua, entregue al profesor antes del 24 de octubre, la hoja de inscripción en este tipo de evaluación. Una vez expresado por escrito su deseo de participar, no podrá cambiar la opción de evaluación. La evaluación continua consta de las cuatro sesiones que figuran en esta guía y del examen final. Las sesiones no son recuperables, es decir, si un alumno no puede presentarse para realizarlas en el día estipulado por el profesor, éste no tiene obligación de repetírselas. Antes de la realización de cada sesión se indicará la fecha y procedimiento de revisión de las calificaciones obtenidas que serán públicas en un plazo razonable de tiempo (por lo general una semana).

La nota final de un alumno que haga evaluación continua se obtendrá mediante la fórmula

$$N = (1/10) \times C + (6/10) \times E$$

C : Nota, entre 0 e 40, obtenida como la suma de las notas de las sesiones de una hora.

E : Nota, entre 0 e 10, obtenida en el examen final sobre los temas 3, 4, 6, 7 y 8 de la materia.

En esta modalidad, un alumno estará aprobado cuando N sea mayor o igual que 5.

La calificación obtenida en las tareas evaluables será válida tan solo para el curso académico en el que se realicen.

2. Evaluación al final del cuatrimestre

Aquellos alumnos que no sigan evaluación continua se podrán presentar a un examen final, que no será necesariamente el mismo que el de la evaluación continua, sobre **todos** los temas de la materia. La fecha de este examen será la misma en la que tendrá lugar el examen final de la evaluación continua. En este caso, el examen será evaluado entre 0 y 10 puntos y un alumno estará aprobado cuando la nota de su examen sea mayor o igual que 5 .

3. Recuperación en el mes de julio (segunda convocatoria)

El día del examen de recuperación, los alumnos que eligieron evaluación continua, podrán optar, si lo desean, a un examen donde la nota se obtenga como

$$NR = (1/10) \times C + (6/10) \times D$$

C : Nota, entre 0 e 40, obtenida como la suma de las notas de las sesiones de una hora.

D : Nota, entre 0 e 10, obtenida en un examen sobre los temas 3, 4, 6, 7 y 8 de la materia de, como máximo, tres horas de duración.

En esta modalidad un alumno estará aprobado cuando **NR** sea mayor o igual que 5 .

En caso de no elegir esta opción, o de no poder hacerlo por no haber seguido evaluación continua, el examen de recuperación será sobre **todos** los contenidos de la materia y será puntuado entre 0 y 10. Este examen tendrá una duración máxima de tres horas y no será necesariamente el mismo que el de la evaluación continua. Un alumno estará aprobado cuando la nota de su examen sea mayor o igual que 5.

4. Nota de No Presentado

Un alumno se considerará no presentado si, como máximo, ha participado en la primera sesión de evaluación continua. En cualquier otro caso, el alumno se considerará presentado y recibirá su nota correspondiente.

Sources of information

J. Stewart, Cálculo de una variable, 4ª edición, Thomson-Learning, 2001

D.G. Zill y W.S. Wright, Cálculo de una variable, 4ª edición, Mc Graw Hill, 2011

E. Marsden y A.J. Tromba, Cálculo vectorial, 5ª edición, Pearson-Addison Wesley, 2004

Recommendations

Subjects that continue the syllabus

(*)Física: Análise de circuitos lineais/V05G300V01201

(*)Física: Campos e ondas/V05G300V01202

(*)Matemáticas: Cálculo II/V05G300V01203

(*)Matemáticas: Probabilidade e estadística/V05G300V01204

Subjects that are recommended to be taken simultaneously

(*)Matemáticas: Álgebra lineal/V05G300V01104

IDENTIFYING DATA				
(*)Física: Análise de circuitos lineais				
Subject	(*)Física: Análise de circuitos lineais			
Code	V05G300V01201			
Study programme	(*)Grao en Enxeñaría de Tecnoloxías de Telecomunicación			
Descriptors	Credit.	Type	Year	Quadmester
	6	Basic education	1st	2nd
Language	(*)Castelán			
Department				
Coordinador	Garcia Mateo, Carmen Sanchez Sanchez, Enrique			
Lecturers	Abreu Sernandez, Maria Victoria Carrascal Castro, Francisco Manuel Garcia Mateo, Carmen Sanchez Sanchez, Enrique Torio Gomez, Pablo			
E-mail	carmen.garcia@uvigo.es enrique.sanchez@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	
A3	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
A4	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.
A9	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
A13	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.

Learning aims		
	Typology	Competences
To know the elements and laws involved in lumped circuit analysis.	know	A13
To show the ability to analyse linear circuits in different circumstances.	know	A4
- to know how to choose among different alternatives when solving a problem.	Know How	A13
- to know simplifying techniques, their constraints, and how to decide which ones must be used.		
To translate the time domain into the transformed domains, by using transforms basic concepts.	know	A13
To be able to qualitatively justify the role played by circuit elements and their interactions.	Know How	A3 A13
To master the language and symbolism of the discipline	Know How	A9

Contents
Topic

I: Introduction	<p>Fundamental and derived magnitudes.</p> <p>Active and passive elements and their functional relationships.</p> <p>Kirchhoff's laws.</p> <p>Simplifying techniques.</p> <p>Analysis by the technique of mesh voltages. Analysis by the techniques of node currents.</p>
II: Transient Response	<p>Transient and steady-state regimes.</p> <p>Transient regime origin.</p> <p>Conditions of study (transient between two steady-state continuous regimes, two reactive elements as a maximum).</p> <p>Inductors and capacitors in steady-state continuous regime.</p> <p>Single reactive element networks: time expression, time constant.</p> <p>Two reactive elements networks: types of responses, time expressions, damping coefficient, angular resonant frequency.</p> <p>Networks changing in several time values.</p> <p>Partially coupled elements networks.</p>
III: Steady-state sinusoidal response	<p>Definition and parameters.</p> <p>Concepts of phasor and impedance.</p> <p>Mesh and node analysis of steady-state sinusoidal regime networks.</p> <p>Autoinductance and mutual inductance.</p> <p>Linear and ideal transformers.</p> <p>Power expressions: instantaneous power, complex power, average power, reactive power.</p> <p>Thévenin and Norton equivalent circuits.</p> <p>Frequency response.</p> <p>Using the superposition principle.</p>
IV: Two-ports	<p>Definition of a two-port circuit.</p> <p>Characteristic parameters.</p> <p>Sets of characteristic parameters.</p> <p>Characteristic parameters determination.</p> <p>Combining two-ports.</p> <p>A two-port in a circuit.</p>
V: Signals and systems	<p>Classes of signals.</p> <p>Some relevant signals: step function, unit impulse function, exponential function, sinusoidal function.</p> <p>Classes of systems.</p> <p>System properties.</p>
VI: Laplace transform	<p>Definition.</p> <p>Direct transforms.</p> <p>Inverse transform determination.</p> <p>Application to linear circuits.</p> <p>The transference function.</p> <p>Steady-state response in a circuit.</p> <p>Response for a sinusoidal input.</p> <p>Application of the superposition principle.</p>
VII: Fourier transform	<p>Fourier series expansion.</p> <p>Expressions of Fourier series expansion.</p> <p>Amplitude and phase spectra.</p> <p>Frequency response.</p> <p>Fourier transform.</p> <p>Fourier transform expressions.</p>
VIII: Filters.	<p>Filter concept.</p> <p>Filter classes.</p> <p>Ideal and real filters.</p> <p>Low pass prototype based design.</p> <p>Butterworth and Chebyshev responses.</p> <p>Relationship among the transient regime and the frequency response.</p>

Planning

	Class hours	Hours outside the classroom	Hores totals
(*)Actividades introductorias	1	0	1
(*)Sesión maxistral	19	19	38
(*) Prácticas de laboratorio	14	28	42
(*)Foros de discusión	0	3	3

(*) Probas de tipo test	3	6	9
(*)Resolución de problemas e/ou exercicios	7	14	21
(*)Probas prácticas, de execución de tarefas reais e/ou simuladas.	12	24	36

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

Methodologies

	Description
(*)Actividades introductorias	Presentation of the course: syllabus, bibliography, teaching methodology, and assessment and grading procedures.
(*)Sesión maxistral	The goal of this methodology is the presentation of the theoretical contents. How the concepts were learned by the students will be also assessed. In 12 of these sessions, written quizzes will be conducted of 15 minutes each as a maximum. In 5 of these sessions, solving problems exercises will be done of 45 minutes each as a maximum.
(*) Prácticas de laboratorio	26 hours are dedicated to laboratory activity. In 8 of them circuit simulation exercises will be done by using the software packages PSpice and Matlab. In other 4 hours, circuit assembling and measurement exercises will be done. All mentioned exercises shall be graded. The remaining 14 hours consist of preparation for the exercises, as well as to settle a relationship among practice contents and lectures.
(*)Foros de discusión	The course web site is hosted in UVIGO e-learning platform (http://fatic.uvigo.es). It includes all the information related to the course. Forums for ideas interchanging and comments will be available.

Personalized attention

	Description
(*) Prácticas de laboratorio	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. Additionally, discussion forums at the web site will be used as communication channel between instructors and students.
(*)Sesión maxistral	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. Additionally, discussion forums at the web site will be used as communication channel between instructors and students.
(*)Foros de discusión	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. Additionally, discussion forums at the web site will be used as communication channel between instructors and students.

Assessment

	Description	Qualification
(*) Probas de tipo test	The student will be faced with 4 possible answers, one and only one being correct. Correct answer choosing will be given 0.25 points; 0 points will be given in any other case. 12 tests are done in the time schedule of lecture sessions.	30
(*)Probas prácticas, de execución de tarefas reais e/ou simuladas.	Two types are to be distinguished: a) simulation exercises (8, test type, pointed with 0 or 0.25 points). b) assembling and measurement (the first one, pointed among 0 and 1; the second one, among 0 and 1.5 points). The ability to work jointly to other course mates, the fitting to design specifications and the presentation will be assessed.	45
(*)Resolución de problemas e/ou exercicios	5 exercises to be done during the time schedule for lecture sessions. Each one is referred to one of the most relevant topics in the course. Given a circuit, the student must calculate several magnitudes. Grading will be among 0 and 0.5 points.	25

Other comments and second call

Additionally to the evaluation system above described, the student may choose to do a final exam. This exam will have the

same characteristics than exercises named "Solving problems and/or exercises ", being evaluated among 0 and 10 points.

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 May - beginning of June). 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.

2. Second opportunity in July. Students not passing the course at the end of the semester may do a final exam like the aforementioned. Points reached in it (among 0 and 10) will be the final grade.

Additional comment: Doing 4 or more tests and/or the final exams will prevent the student to get the "Not presented" mark.

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, "Circuitos eléctricos", ,

Enrique Sánchez, Material docente, Página web, fatic.uvigo.es

J.H. McClellan, R.W. Schafer, M.A. Yoder, Signal Processing First, , Pearson Prentice Hall

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

(*)Procesado digital de señales/V05G300V01304

Subjects that it is recommended to have taken before

(*)Matemáticas: Álgebra lineal/V05G300V01104

(*)Matemáticas: Cálculo 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				
(*)Física: Campos e ondas				
Subject	(*)Física: Campos e ondas			
Code	V05G300V01202			
Study programme	(*)Grao en Enxeñaría de Tecnoloxías de Telecomunicación			
Descriptors	Credit.	Type	Year	Quadmester
	6	Basic education	1st	2nd
Language	(*)Castelán			
Department				
Coordinador	Garcia Pino, Antonio			
Lecturers	Arias Acuña, Alberto Marcos Garcia Pino, Antonio Garcia-Tuñon Blanca, Ines Gomez Araujo, Marta Obelleiro Basteiro, Fernando Rubiños Lopez, Jose Oscar			
E-mail	agpino@uvigo.es			
Web	http://faitic.uvigo.es			
General description	(*)"Fields and Waves" presents the first contact of the student of the *titulación with the phenomena of the electromagnetic wave, that is the physical support of the transmission of the information to speed almost instantaneous. They will enter the mathematical models of the electromagnetic fields that allow to comprise the behaviour of the electromagnetic waves in real surroundings.			

Competencies

Code	
A3	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
A10	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
A12	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.

Learning aims

	Typology	Competences
Understanding and mastery of the general laws of fields and waves	know	A12
Knowledge of basic topics and technologies, enabling students to learn new methods and technologies, as well as endowed with the versatility to adapt to new situations.	know	A3
Ability to solve math problems that may arise in engineering: Ability to apply knowledge of linear algebra, geometry and differential geometry.	Know How	A10
Ability to solve math problems that may arise in engineering: Ability to apply knowledge of differential and partial-differential equations	Know How	A10

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 Electrostatic field in material media 2.5 Electric Conductors: Capacity and Energy 2.6 Equations of Poisson and Laplace
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 field in material media 3.5 Systems of inductors, inductance and energy
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 Introduction. 5.2 Wave equation for time harmonic fields 5.3 Propagation, attenuation and phase constants 5.4 Solutions in rectangular, cylindrical and spherical coordinates 5.5 Progressive, stationary and evanescent waves in lossy and lossless media
6. Plane waves in free space	6.1 Expressions of the fields 6.2 Wave Impedance 6.3 Poynting Vector 6.4 Instant fields 6.5 Polarization

Planning

	Class hours	Hours outside the classroom	Hores totals
(*) Sesión maxistral	28	42	70
(*) Estudio de casos/análises de situaciones	14	21	35
(*) Resolución de problemas e/ou ejercicios	7	14	21
(*) Prácticas de laboratorio	2	0	2
(*) Resolución de problemas e/ou ejercicios	3	7.5	10.5
(*) Probas de resposta longa, de desenvolvemento	2	8	10
(*) Informes/memorias de prácticas	0	1.5	1.5

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

Methodologies

	Description
(*) Sesión maxistral	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.
(*) Estudio de casos/análises de situaciones	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.
(*) Resolución de problemas e/ou ejercicios	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.
(*) Prácticas de laboratorio	Activities of application of the knowledges to concrete situations and of acquisition of basic skills and procedures related to the matter object of study. They are developed in rooms with skilled equipment.

Personalized attention

Description

(*) Sesión maxistral	The students will have occasion of attend to personalized tutorial sessions in the office of the professor during the schedule established for that at the beginning 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.
(*) Resolución de problemas e/ou exercicios	The students will have occasion of attend to personalized tutorial sessions in the office of the professor during the schedule established for that at the beginning 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.
(*) Estudo de casos/análises de situacións	The students will have occasion of attend to personalized tutorial sessions in the office of the professor during the schedule established for that at the beginning 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.
(*) Informes/memorias de prácticas	The students will have occasion of attend to personalized tutorial sessions in the office of the professor during the schedule established for that at the beginning 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
(*) Probas de resposta longa, de desenvolvemento	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
(*) Resolución de problemas e/ou exercicios	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.	36
(*) Informes/memorias de prácticas	Elaboración of a document by the students in which they reflect the characteristics of the work carried out. The students have to describe the tasks and procedures developed, show the results obtained or observations realised, as well as the analysis and treatment of data.	4

Other comments and second call

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

1. CONTINUOUS EVALUATION. The continuous evaluation consists of of the tasks described in this guide and are not recoverable, what means that if a student can not fulfil them in the term stipulated, the professor does not have duties to repeat them. The obtained qualification will be valid only for the current academic course. The system of continuous evaluation consists of: a) Three sessions of resolution of exercises, in the weeks 4, 9 and 13 (roughly); b) Delivery in the last week of classes of a report about the practices of measurements that the student attended. The maximum qualification are 3.6 points for item a) and 0.4 points for item b). Before the execution or delivery of each task, the date and procedure of review of the qualifications will be published, taking into account that the qualifications must be also published in a reasonable term of time. Previously to the exam (or at the entrance to the session) the student will express his or her choice to receive the qualification by continuous evaluation system or only by the final exam.

2. SEMESTER FINAL EXAM. There will be a final exam divided into two parts: The first part is mandatory for all students and its weight is 6 points. The second part will be mandatory for the students that do not opt by continuous evaluation and its value is 4 points. The students that choose continuous evaluation can optionally take the second part in order to improve their qualifications of continuous evaluation.

Formula of qualification: $E1$ =test score of the first part of the final exam until 6 points. $E2$ =test score of the second part of the exam until 4 points. P =Score of the problems and exercises of continuous evaluation until 3.6 points. M =score of the laboratory report until 0.4 points. N =Final Qualification (it will be necessary 5 points to approve and there are not exigible minima in each part). Students that did not choose continuous evaluation: $N=E1+E2$. Students that chose continuous evaluation: $N=E1+M+\max(P;0,9 \cdot E2)$.

3. RECOVERY IN THE JULY SESSION. Previously to the exam (or at the entrance to the session) the students will express his or her choice to receive the qualification by continuous evaluation system or only by the final exam.

It will be considered as presented every student that received any of the two final exams or two of the exercises of continuous evaluation.

Sources of information

Basic:

- Fundamentos de Electromagnetismo para Ingeniería, D.K. Cheng. Ed. Addison Wesley, 1998. (or its original english version: Fundamentals of Engineering Electromagnetics, D.K.Cheng, Ed. Addison Wesley 1993)
- Campos electromagnéticos, F. Dios, D. Artigas et all. Ediciones UPC. 1998.
- Fundamentos de la Teoría Electromagnética, J.R. Reitz, F.J. Milford, R.W. Christy, Ed. Addison Wesley, 1996

Complementary:

- Field and Wave Electromagnetic, D.K. Cheng, 2ª edición, Ed.Addison-Wesley. 1989.
- Electromagnetic Waves, U.S. Inam y A.S. Inan. Ed. Prentice Hall. 2000.
- Teoría Electromagnética, 7ª Ed. W.H. Hayt Jr., J.A.Buck. Ed. Mc Graw Hill, 2006.
- Ondas Planas, J.E. Page, C. Camacho. Serv. Pub. ETSIT Madrid. 1983.
- Electromagnetic Fields and Waves, M. F. Iskander. Ed. Prentice Hall. 1992.
- Problemas de campos electromagnéticos. Serv. Pub. ETSIT Madrid. 2001.

Recommendations

Subjects that continue the syllabus

(*)Transmisión electromagnética/V05G300V01303

Subjects that are recommended to be taken simultaneously

(*)Matemáticas: Cálculo II/V05G300V01203

Subjects that it is recommended to have taken before

(*)Matemáticas: Cálculo I/V05G300V01105

IDENTIFYING DATA				
(*)Matemáticas: Cálculo II				
Subject	(*)Matemáticas: Cálculo II			
Code	V05G300V01203			
Study programme	(*)Grao en Enxeñaría de Tecnoloxías de Telecomunicación			
Descriptors	Credit.	Type	Year	Quadmester
	6	Basic education	1st	2nd
Language	(*)Castelán			
Department				
Coordinador	Gonzalez Rodriguez, Ramon			
Lecturers	Gonzalez Rodriguez, Ramon Martinez Varela, Aurea Maria Prieto Gomez, Cristina Magdalena			
E-mail	rgon@dma.uvigo.es			
Web	http://fatic.uvigo.es/			
General description	(*)In the matter of Calculation *II of the Degree in Engineering of Technologies of Telecommunication provides basic and common training to the branch of the telecommunication. Such and as it features in the memory of the degree to the *finalizar the *cuatrimestre, the student will have to be able to formulate, resolve and interpret mathematically own problems of the engineering of telecommunication. For this, when surpassing the matter, will have to know calculate integral of functions of one and of several variables, know his meaning and dominate with *soltura the basic numerical methods of approximation of integral. On the other hand, it has to familiarise with the developments of functions in series of Fourier and finally will have to know resolve differential equations of first and second order. All these contents are notable for several matters that has to *cursar simultaneously or later in the *titulación			

Competencies	
Code	
A3	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
A4	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.
A10	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

Learning aims		
	Typology	Competences
(*)Capacidade para a resolución dos problemas matemáticos que poidan exporse na enxeñaría. Aptitude para aplicar os coñecementos sobre: álgebra lineal; xeometría; xeometría diferencial; cálculo diferencial e integral; ecuacións diferenciais e derivadas parciais; métodos numéricos; algorítmica numérica; estatística e optimización.	Know How	A10
(*)Coñecemento de materias básicas e tecnoloxías que capaciten o alumno para a aprendizaxe de novos métodos e tecnoloxías, así como para dotalo dunha gran versatilidade para adaptarse a novas situacións.	know	A3
(*)Capacidade para resolver problemas con iniciativa, para a toma de decisións, a creatividade, e para comunicar e transmitir coñecementos, habilidades e destrezas, comprendendo a responsabilidade ética e profesional da actividade do Enxeñeiro Técnico de Telecomunicación.	Know How	A4

Contents	
Topic	
(*)Tema 1. Cálculo integral en R.	(*)

(*)Tema 2. Funcións ortogonais e series de Fourier.	(*)Funcións ortogonais. Series de Fourier. Series de Fourier de senos e cosenos. Desenvolvementos de series de Fourier de funcións pares e impares. Converxencia. A transformada de Fourier.
(*)Tema 3. Métodos numéricos para a aproximación de integrais.	(*)Fórmulas de cuadratura de tipo interpolatorio polinómico. Propiedades. Erro de interpolación. Casos particulares: Poncelet, Trapecio e Simpson. Fórmulas de cuadratura composta.
(*)Tema 4. A integral múltiple no sentido de Riemann.	(*)As integrais dobres e triples en rexións elementais. Cambio da orde de integración. Teoremas de cambio de variable. Coordenadas cilíndricas e esféricas. Aplicacións.
(*)Tema 5. Introducción ás ecuacións diferenciais ordinarias.	(*) Xeneralidades sobre as ecuacións diferenciais. Concepto de solución. Ecuacións diferenciais de primeira orde. Existencia e unicidade de solución. Ecuacións autónomas. Variábeis separábeis. Ecuacións homoxéneas. Ecuacións exactas. Ecuacións lineais. Familias de curvas e traxectorias ortogonais.
(*)Tema 6. Ecuacións diferenciais ordinarias de segunda orde.	(*)Ecuacións diferenciais de segunda orde e orde superior. Ecuacións diferenciais lineais homoxéneas e non homoxéneas. Ecuacións diferenciais lineais con coeficientes constantes. Coeficientes indeterminados. Variación de parámetros. Ecuación de Cauchy-Euler
(*)Tema 7. A transformada de Laplace.	(*)Definición da transformada de Laplace. Derivadas e integrais das transformadas de Laplace. Aplicación á solución de ecuacións diferenciais.

Planning

	Class hours	Hours outside the classroom	Hores totals
(*) Resolución de problemas e/ou exercicios	17	17	34
(*) Prácticas de laboratorio	3	6	9
(*)Sesión maxistral	28	56	84
(*)Resolución de problemas e/ou exercicios	5	10	15
(*)Probos prácticos, de execución de tarefas reais e/ou simuladas.	1	1	2
(*)Resolución de problemas e/ou exercicios	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
(*) Resolución de problemas e/ou exercicios	(*)In these hours of work the professor will resolve problems of each one of the subjects and will enter new methods of resolution not contained in the classes *magistrales from a practical point of view. The student also will have to resolve problems proposed by the professor with the aim to apply the knowledges purchased.
(*) Prácticas de laboratorio	(*)In these practices will use the computer tools *MATLAB or *MAXIMA to study the numerical methods of approximation of integrals described in the Subject 3 of the matter.
(*)Sesión maxistral	(*)The professor will expose in this type of classes the theoretical contents of the matter.

Personalized attention

Description

(*) Sesión maxistral	(*) 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 laboratories and in the schedules of *tutorías, as of form no *presencial by means of the platform *Faitic. The students will have occasion of *acudir to *tutorías *personalizadas 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 *asignatura
(*) Resolución de problemas e/ou exercicios	(*) 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 laboratories and in the schedules of *tutorías, as of form no *presencial by means of the platform *Faitic. The students will have occasion of *acudir to *tutorías *personalizadas 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 *asignatura
(*) Prácticas de laboratorio	(*) 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 laboratories and in the schedules of *tutorías, as of form no *presencial by means of the platform *Faitic. The students will have occasion of *acudir to *tutorías *personalizadas 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 *asignatura

Assessment		
	Description	Qualification
(*) Resolución de problemas e/ou exercicios	(*) Five sessions of an hour. First session (week 4): Subject 1 Second session (week 7): Subject 2 Third session (week 11): Subject 4 Fourth session (week 13): Subject 5 Fifth session (week 15): Subject 6 The five proofs add a 35% of the note having each one the following weight: First: 10% Second: 5% Third: 10% Fourth: 5% Fifth: 5%	35
(*) Probas prácticas, de execución de tarefas reais e/ou simuladas.	(*) The student will do a practice of laboratory of the Subject 3 with *Matlab or *Maxima in the week 7.	5
(*) Resolución de problemas e/ou exercicios	(*) Final examination.	60

Other comments and second call

(*)

A avaliación será preferentemente continua. O alumno, nas dúas primeiras semanas de clase, entregará ó profesorado da materia un formulario para inscribirse neste tipo de avaliación. Unha vez expresado o seu desexo de participar por escrito non poderá darse de baixa da avaliación continua.

As probas da avaliación continua non son recuperables, é dicir, se un alumno non pode cumprilas no prazo estipulado, o profesor non ten obrigación de repetirlas. Antes da realización de cada proba indicárase a data e procedemento de revisión das cualificacións obtidas que serán públicas nun prazo razoable de tempo (polo xeral unha semana). A avaliación obtida nas tarefas avaliáveis será válida tan só para o curso académico no que se realicen.

Nas probas da avaliación continua o alumno resolverá problemas e exercicios dos temas da materia.

1. Avaliación continua.

A nota final dun alumno que faga a avaliación continua obtense mediante a fórmula

$$N = (4/10) \times C + (6/10) \times E$$

C : Nota, entre 0 e 10, obtida como a media ponderada das notas das sesións dunha hora incluíndo a práctica de laboratorio.

E : Nota, entre 0 e 10, obtida nun exame de dúas horas dos temas 4,5,6 e 7.

Nesta modalidade **un alumno estará aprobado cando N sexa maior ou igual que 5**.

2. Avaliación final do cuadrimestre.

Aqueles alumnos que non fagan a avaliación continua, poderanse presentar a un exame final de todos os temas da materia na mesma data que a do exame final da avaliación continua. Nesta outra modalidade serán avaliados de 0 a 10 puntos e **un alumno estará aprobado cando a nota do seu exame sexa maior ou igual que 5**.

3. Recuperación de xullo.

No día do exame de recuperación, os alumnos que elixiron avaliación continua, poderán optar, se o desexan, a un exame e a nota final obtense como

$$NR = (4/10) \times C + (6/10) \times D$$

C : Nota, entre 0 e 10, obtida como a media ponderada das notas das sesións dunha hora, incluíndo a práctica de laboratorio, que forman parte da avaliación continua.

D : Nota, entre 0 e 10, obtida nun exame de tres horas dos temas 4,5,6 e 7.

Nesta modalidade **un alumno estará aprobado cando NR sexa maior ou igual que 5.**

En caso de non elixir esta opción, ou de non poder facelo por mor da non participación na avaliación continua, o exame de recuperación será de todos os temas da materia. Nesta outra modalidade serán avaliados de 0 a 10 puntos. **Un alumno estará aprobado cando a nota do seu exame sexa maior ou igual que 5.**

4. Nota de non presentado.

Finalmente, un alumno considerárase non presentado se non se presenta a ningunha das probas e exames da materia. En caso contrario considérase presentado e polo tanto recibirá a nota que lle corresponda.

Sources of information

D. Zill y W.S. Wright, Cálculo de una variable, 4ª, McGraw-Hill (2011)

E. Marsden e A.J. Tromba. , Cálculo vectorial, 5ª, Pearson-Addison Wesley (2004)

D.G. Zill e M.R. Cullen, Ecuaciones diferenciales, 3ª, McGraw-Hill (2008)

A. Quarteroni e F. Saleri, Cálculo científico con Matlab y Octave, 1ª, Springer (2006)

Recommendations

Subjects that continue the syllabus

(*)Física: Campos e ondas/V05G300V01202

Subjects that are recommended to be taken simultaneously

(*)Física: Análise de circuitos lineais/V05G300V01201

(*)Física: Campos e ondas/V05G300V01202

(*)Matemáticas: Probabilidade e estadística/V05G300V01204

Subjects that it is recommended to have taken before

(*)Matemáticas: Álgebra lineal/V05G300V01104

(*)Matemáticas: Cálculo I/V05G300V01105

IDENTIFYING DATA				
(*)Matemáticas: Probabilidade e estadística				
Subject	(*)Matemáticas: Probabilidade e estadística			
Code	V05G300V01204			
Study programme	(*)Grao en Enxeñaría de Tecnoloxías de Telecomunicación			
Descriptors	Credit.	Type	Year	Quadmester
	6	Basic education	1st	2nd
Language	(*)Castelán			
Department				
Coordinador	Fernandez Bernardez, Jose Ramon			
Lecturers	Alonso Alonso, Ignacio Fernandez Bernardez, Jose Ramon Mojon Ojea, Artemio Torres Guijarro, Marisol			
E-mail	jramon.fernandez@uvigo.es			
Web	http://faitic.uvigo.es			
General description	(*)In this *asignatura review some basic concepts of statistics, probability and necessary random processes stop can follow with ease other back matters in the career.			

Competencies	
Code	
A3	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
A4	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.
A10	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
B1	The ability for critical reading of scientific papers and docs.

Learning aims		
	Typology	Competences
(*)	know	A10
(*)A3	know	A3
(*)A4	Know How	A4
(*)	Know How	B1

Contents	
Topic	
(*)Teoría de la probabilidad	(*)Concepto de probabilidad. Definición axiomática. Probabilidad condicional, teorema de las probabilidades totales y de Bayes. Independencia
(*)Variables aleatorias unidimensionales	(*)Concepto de variable aleatoria. Clasificación. Función de distribución y propiedades. VA discretas: función de masa de probabilidad VA continuas: función de densidad. Transformaciones de VA. FD y VA discretas Transformación de VA continuas: teorema fundamental Esperanza y varianza

(*)Vectores aleatorios	(*)FD y VA continuas Marginales. Masas puntuales y lineales fdp condicionada. Versiones continuas de Bayes y probabilidades totales Transformaciones bidimensionales: teorema fundamental Cambios de dimensión Correlación y regresión
(*)Estimación y teoremas límite	(*)Muestra y población. Estimadores. Estimación de la media y su error estándar Sucesiones de VA. Leyes de los grandes números. Teorema central del límite
(*)Procesos estocásticos	(*)Descripción de un proceso estocástico Estadísticos de un PE Estacionariedad Ejemplos

Planning

	Class hours	Hours outside the classroom	Hores totals
(*)Sesión maxistral	24	24	48
(*) Resolución de problemas e/ou ejercicios	13.5	28	41.5
(*)Prácticas en aulas de informática	14	7	21
(*)Resolución de problemas e/ou ejercicios	1	4	5
(*) Probas de tipo test	0.5	2	2.5
(*)Probas prácticas, de ejecución de tarefas reais e/ou simuladas.	0.5	2	2.5
(*)Traballos e proxectos	0	6	6
(*)Outras	0.5	1	1.5
(*)Probas de resposta longa, de desenvolvemento	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
(*)Sesión maxistral	(*)The course structure in five big subjects. Each subject will have a theoretical part that will be exposed by the professors in big group. It will ask them to the students realise a previous reading of the contents.
(*) Resolución de problemas e/ou ejercicios	(*)Each subject will complement with the resolution of problems. In some occasions will realise in big group and in others in average group. It will require that the students work previously on these problems.
(*)Prácticas en aulas de informática	(*)Each subject complete with one or several sessions of computer practices. For this it will use a software of own development and a specific questionnaire for each subject.

Personalized attention

	Description
(*)Sesión maxistral	(*)The students will have occasion of *acudir to *tutorías *personalizadas in the time that the professors will establish to such effect at the beginning of the course. This schedule will publish in the web of the *asignatura.
(*) Resolución de problemas e/ou ejercicios	(*)The students will have occasion of *acudir to *tutorías *personalizadas in the time that the professors will establish to such effect at the beginning of the course. This schedule will publish in the web of the *asignatura.
(*)Prácticas en aulas de informática	(*)The students will have occasion of *acudir to *tutorías *personalizadas in the time that the professors will establish to such effect at the beginning of the course. This schedule will publish in the web of the *asignatura.
(*)Traballos e proxectos	(*)The students will have occasion of *acudir to *tutorías *personalizadas in the time that the professors will establish to such effect at the beginning of the course. This schedule will publish in the web of the *asignatura.

Assessment

Description	Qualification
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(*)Traballos e proxectos	(*)The students, in groups of 4, have to pose four question type test on a 10 concrete subject.	
(*)Resolución de problemas e/ou exercicios	(*)In two occasions along the course, the students will have to resolve a problem that will pose them in the final part of class of group *B	15
(*) Probas de tipo test	(*)In the final part of a class of group *B, the students will have to answer a test	10
(*)Probas de resposta longa, de desenvolvemento	(*)Final examination	50
(*)Probas prácticas, de execución de tarefas reais e/ou simuladas.	(*)In class of group *B, poses them a questionnaire that, with help of the computer owe to answer by writing. The students distribute by couples. Each couple answers an only questionnaire.	10
(*)Outras	(*)Each student will correct a problem realised by a mate. It will employ the final part of a class of group *B.	5

Other comments and second call

(*)

Following the proper guidelines of the *titulación will offer to the students that *cursen this subject two systems of evaluation: continuous evaluation and evaluation at the end of the *cuadrimestre.

The continuous evaluation is based in a series of tasks. Each student can opt to do or no the continuous evaluation. It considers that a student opts by the continuous evaluation realizes the task 3 (roughly the week 7 of the *cuadrimestre). The tasks 1 and 2 will be able to realize and after them not opting to the continuous evaluation.

Students that opt by continuous evaluation:

Stop the evaluation establish distinct tasks *avaliabes. It indicates this list of tasks and his weight in the final note. Also indicates the week of the *cuadrimestre in the that, roughly, will realize .

Task 1: individual Resolution of a problem. Weight #5%. Week 4

Task 2: Correction of the problem realized by a mate. Weight #5%. Week 5

Task 3: *Elaboración of a test. It realizes in groups of 4. Weight #10%. Week 7

Task 4: Realization of a test. Weight #10%. Week 10

Task 5: individual Resolution of a problem. Weight #10%. Week 12

Task 6: Answer a questionnaire by couples with help of the computer. Weight #10%. Week 14

The last task of the continuous evaluation will be a final @exame. This will be a version reduced of the @exame that will realize the students that do not opt by continuous evaluation. The weight of the @exame in the final note will be of 50%.

Before the realization or delivery of each task will indicate the date and procedure of review of the qualifications obtained. The students will have option to know the qualification of each task and review the correction in a reasonable term of time (a week, generally).

These tasks are not recoverable, is to say, if a student can not fulfil them in the term stipulated the professor does not have obligation to repeat him them.

The qualification obtained in the tasks *avaliabes will be valid so alone stop the academic course in the that realize .

If a student took part in the continuous evaluation and does not approve the subject will receive a qualification of *suspensio, independently @de que present to the final @exame or no.

The final note of the students that opt by continuous evaluation will calculate how the average between it senses of the final @exame and the note of the previous tasks. For *minimizar the impact of the possible loss of a previous task, the average of these will realize excluding the worst of the qualifications obtained. Having in account that the tasks 1 and 2 are two parts of the even exercise, and that go in both weigh a #10%, will consider an alone to effects to exclude the worst qualification.

Students that opt by evaluation at the end of the *cuadrimestre:

To the students that do not opt by the continuous evaluation will offer them the possibility of *acudir it a final @exame. This @exame will be zoned between 0 and 10 and this will be the final note that obtain.

Recovery in July

Stop the announcement of recovery (July) the student that did not approve the subject chooses wishes realize the complete @exame or applies him the procedure of continuous evaluation described previously keeping the note obtained in the previous tasks. The same day of the @exame, before the realization of the even, the students involved owe to communicate to the professor to election realized.

It considers that the subject is approved if the final note obtained is equal or upper to 5.

Sources of information

H. Stark y J.W. Woods, Probability, Random Processes, and estimation theory for engineers, 2, Prentice Hall, 1994

X. Rong Li, Probability, Random Signals and Statistics, 1, CRC Press, 1999

R. Cao y otros, Introducción a la estadística y sus aplicaciones, 1, Pirámide, 2001

P. Peebles, Principios de probabilidad, variables aleatorias y señales aleatorias, 4, McGraw-Hill, 2006

A. Papoulis, Probability, random variables and stochastic processes, 4, McGraw-Hill, 2002

D. Peña, Estadística, modelos y métodos. Tomo 1: Fundamentos, 2, AUT, 1991

(*)In addition to the bibliography signalled previously, the student *disporá of the following material of support:

-Aim of the subject

-Bulletins of problems

-Questionnaires of laboratory

The main characteristics of the aim of the subject are:

-Include the theoretical contents that constitute the program of the subject.

-Include space for exercises and problems. Some resolve in class and others are proposed.

-At the end of each chapter exists a group of readings recommended and of problems proposed *pertencentes it any of the books included in the bibliography. Generally these problems are something simpler that the problems of the bulletins of the subject.

The bulletins of problems contain useful exercises to understand the subject.

The questionnaires of the laboratory include the billed and the problems of each practical and also #some theoretical contents. It IS very important to read them with sufficient *antelación to the realization of the practical, for like this be able to realize it properly.

This material will be available through the platform *faiTIC of the university of Vigo (<http://faiTIC.uvigo.es>)

Recommendations

Subjects that are recommended to be taken simultaneously

(*)Matemáticas: Cálculo II/V05G300V01203

Subjects that it is recommended to have taken before

(*)Matemáticas: Álgebra lineal/V05G300V01104

(*)Matemáticas: Cálculo I/V05G300V01105

IDENTIFYING DATA				
(*)Programación I				
Subject	(*)Programación I			
Code	V05G300V01205			
Study programme	(*)Grao en Enxeñaría de Tecnoloxías de Telecomunicación			
Descriptors	Credit.	Type	Year	Quadmester
	6	Mandatory	1st	2nd
Language	(*)Castelán			
Department				
Coordinador	Caeiro Rodriguez, Manuel			
Lecturers	Alvarez Sabucedo, Luis Modesto Caeiro Rodriguez, Manuel Costa Montenegro, Enrique Garcia Palomares, Ubaldo Manuel Santos Gago, Juan Manuel Santos Suarez, Jose Manuel			
E-mail	manuel.caeiro@det.uvigo.es			
Web	http://fatic.uvigo.es			
General description	The main aim of this subject is the development of capacities of programming in a language of high level. The paradigm of programming that follows is the one of structured programming.			

Competencies

Code	
A4	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.
A9	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
A15	The ability to learn independently new knowledge and appropriate techniques for the conception, development and exploitation of telecommunication systems and services
A21	The knowledge and use of basics in telecommunication networks, systems and service programming.

Learning aims

	Typology	Competences
Ability to express the solution of a simple problem with algorithms using top-down design.	Know How	A4 A21
Ability to identify the data needed to solve a problem and associate them with the corresponding types according to their characteristics (size, range, operators acting on them).	Know How	A4 A21
Encode simple algorithms from the three basic types of statements: assignment, selection and iteration.	Know How	A21
To declare and define functions by proper use of parameter passing.	Know How	A21
Manage the operations of I / O and file operations.	Know How	A21
Define and use structured data types.	Know How	A21
Define and manage dynamic data structures (lists, stacks, queues and trees).	Know How	A21
Creating and using library modules and functions within a program.	know Know How	A15 A21
Predicting the outcome of a sequence of basic statements, known input data.a.	know	A21
Handle basic tools for program development: text editor, compiler, linker, debugger and tools for documentation.	Know How	A15
Develop small-scale software projects following all phases: requirements analysis, design, construction, evaluation and documentation.	Know How Know be	A4 A9 A15 A21

Contents

Topic

Topic 1: The computer and programming languages	<ol style="list-style-type: none">1. The computer2. Programming concepts, software and programming paradigm3. Stages of software development4. Programming languages in terms of their level of abstraction5. Source code and object code6. Compilers and interpreters7. The concept of algorithm8. Flowcharts, pseudo-code and natural language for the representation of algorithms9. General structure of a C program
Topic 2: Basic elements (integers, characters, real and pointers)	<ol style="list-style-type: none">1. Key Concepts C: data type, identifier, variable, constant, operator and expression2. Basic data types, their characteristics in terms of size, range, and memory storage, and operations that act on them3. Identifiers4. Arithmetic operators5. Logical operators6. Type conversions7. Declaration and assignment operations8. ASCII code9. Pointer Concept10. Direction and Indirection operators
Topic 3: Control Structures (assignment, conditional, iterative and input / output)	<ol style="list-style-type: none">1. Basic types of control structures (sequence, selection and repetition)2. Selection Statements (if-then-else, switch, operator?)3. Judgments of repetition (for, while, do-while, break, continue)4. Basic input / output keyboard and screen (printf, scanf)5. Compilation Directives <p>Operaciones básicas de entrada/salida por teclado y pantalla (printf, scanf)</p> <p>Directivas de compilación</p>
Topic 4: Functions	<ol style="list-style-type: none">1. Modular or procedural programming, problem reduction2. Principles of structured programming3. Function concept: function header, declaration, definition, called4. Functions without parameters5. Global variables, local and static6. Functions with parameter passing by value7. Functions with parameter passing by reference8. Pass arguments through command line (argc, argv [])9. Recursion
Topic 5: Structured data types	<ol style="list-style-type: none">1. Data structures (array, struct, union)2. Dimensional and two dimensional arrays3. Strings4. Declaration and use of data structures5. Typedef Instruction6. Nested Structures7. Library functions that manage strings
Topic 6: Files	<ol style="list-style-type: none">1. Concept of file and stream2. Standard Flows3. File type: text and data4. Basic operations on files, opening and closing, reading, writing5. Access Modes6. Macros NULL and EOF7. Library functions input / output files8. Writing and reading format
Topic 7: Dynamic Memory Management	<ol style="list-style-type: none">1. Introduction to dynamic memory management2. Library functions for dynamic memory management3. Types of linked lists most common: single, double, circular, circular double binary tree4. Creation schemes, placement, search and elimination in a simple linked lists5. Structure of the nodes in a simple linked lists6. Pass files to list and vice versa

Planning			
	Class hours	Hours outside the classroom	Hores totals
(*)Actividades introductorias	2	2	4
(*)Sesión maxistral	26	26	52
(*) Prácticas de laboratorio	14	14	28
(*)Proxectos	9	9	18
(*)Titoría en grupo	0	2	2
(*) Probas de tipo test	0	6	6
(*)Probas prácticas, de execución de tarefas reais e/ou simuladas.	2	8	10
(*)Resolución de problemas e/ou exercicios	2	18	20
(*)Traballos e proxectos	1	9	10
*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.			

Methodologies	
	Description
(*)Actividades introductorias	Introduction to the subject both in its theoretical component and practical components
(*)Sesión maxistral	Presentation by part of the professor of the contents of the subject. These sessions will include the realisation of works and the realisation of program by part of the students. Some of these works will be individual and in others in group..
(*) Prácticas de laboratorio	In these practices will pose the development of practices guided and the realisation of programs. These practices take place along the first part of the semester. There Will be practical evaluated.
(*)Proxectos	In the second part of the laboratory proposes to the student the realisation of a project. This project realise along the second part of the semester.
(*)Titoría en grupo	These tutorial sessions arise for the review of the works proposed in the master classes and laboratory works

Personalized attention	
	Description
(*)Sesión maxistral	The students will have the change to attend to tutorial sessions in the office of the professor in the time that the professors will establish to such effect in the beginning of the course and that will be published in the page of the subject. This tutorial sessions are provided for the resolution of doubts on the concepts entered in the master classes and the activities realised in the practices of laboratory and in the project.
(*) Prácticas de laboratorio	The students will have the change to attend to tutorial sessions in the office of the professor in the time that the professors will establish to such effect in the beginning of the course and that will be published in the page of the subject. This tutorial sessions are provided for the resolution of doubts on the concepts entered in the master classes and the activities realised in the practices of laboratory and in the project.
(*)Proxectos	The students will have the change to attend to tutorial sessions in the office of the professor in the time that the professors will establish to such effect in the beginning of the course and that will be published in the page of the subject. This tutorial sessions are provided for the resolution of doubts on the concepts entered in the master classes and the activities realised in the practices of laboratory and in the project.

Assessment		
	Description	Qualification
(*)Sesión maxistral	Assignments and exercises requested during the development of the master classes.	10
(*) Prácticas de laboratorio	Assignments and exercises requested during the laboratory practices.	10
(*)Proxectos	The evaluation of the project will be made by means of two partial deliveries. One will focus on the design and the other in the functionality.	15
(*) Probas de tipo test	4 multiple choice tests will be conducted throughout the course.	10
(*)Probas prácticas, de execución de tarefas reais e/ou simuladas.	2 exercises will be conducted in the laboratory individually that will include the completion of a program on the computer	10
(*)Resolución de problemas e/ou exercicios	Final exam on all the contents of the subject	40
(*)Traballos e proxectos	Interview or exercise on the project developed in the laboratory. This exercise is in group.	5

Other comments and second call

Below is the planning of the subject by showing subjects the estimated time of the most important milestones of assessment:

- Week 1: Subject 1
- Week 2: Subject 2 and *C.1 (Test 1-not evaluated)
- Week 3: Subject 2 and Subject 3
- Week 4: Subject 3
- Week 5: Subject 3 and *L.1 (Practical assignment 1)
- Week 6: Subject 4 and *T.1 (Master class assignment 1)
- Week 7: Subject 4 and *C.2 (Test 2)
- Week 8: Subject 4 and Subject 5
- Week 9: Subject 5 and *T.2 (Master class assignment 2)
- Week 10: Subject 5 and Subject 6 and *P.1 (Project 1) and *C.3 (Test 3)
- Week 11: Subject 6 and *T.3 (Master class assignment 3)
- Week 12: Subject 7
- Week 13: Subject 7 and *C.4 (Test 4)
- Week 14: Subject 7 and *L.2 (Practical assignment 2) and *P.2 (Project 2)

Following the proper guidelines of the study program **two systems of evaluation** offered to the students that follow this subject: **continuous evaluation** and **evaluation at the end of the semester**. It understands that a student follows **the continuous evaluation** if she/he does not opt by the evaluation **at the end of the semester**. The decision to opt by this option can be taken before the week the grade of the first **practical proof** (*L.1) that will be held in the laboratory is provided.

To pass the subject in the **continuous evaluation** the student has to obtain at least 50% of the qualification of the practical part (laboratory assignments, projects, practical proofs, and interview about the project) and 50% of the theoretical part (master session assignments, tests and final exam). The continuous evaluation consists of the tasks that detail in this guide and are not recoverable, is to say, if a student can not fulfil them in the term stipulated the professor does not have the obligation to repeat her/him them. The score in the assessment tasks will be valid only for the academic year in which they are made.

The **evaluation at the end of the semester** will consist in the delivery of one project and the realization of exercises of programming with both paper and computer.

The qualification is not presented in the following cases:

1. In case of **not opting** by the evaluation at the end of the semester only if she/he does not present any delivery afterwards of the practical proof *L.1.
2. In case of **yes opt** by the evaluation at the end of the semester only if she/he does not realize the proofs indicated.

In the extraordinary calls two types of evaluation are provided:

- The first for those **the students that follow the continuous evaluation** during the course. In this case the evaluation will consist in the realization of the final exam (theoretical part) and/or of the delivery of an extension of the program project and the realization of an exercise in the laboratory (practical part). The two previous proofs will have to do both or only one of them in the following cases:
 - The final exam for the theoretical part if in the ordinary call she/he has failed it;
 - The delivery of the extension of the program project and the exercise of corresponding laboratory practical part if in the ordinary call she/he has failed it;
 - Both if she/he meets the other two or if the student so desires.
- The second for those **students that do not follow the continuous evaluation** or that followed it but that want to abandon it. This evaluation will consist in the delivery of one project and the realization of exercises of programming both in paper and with the computer.

The student that can opt of voluntary for one or another option will be able to do it untill the moment of delivery or realization of the corresponding proofs.

The qualification obtained in the continuous evaluation is not save in a course for the next.

In case of detection of plagiarism in some of the work the qualification will be negative and teachers will communicate to the school address the issue to take measures it deems appropriate. In case that plagiarism is detected in any of the continuous evaluation works the student will not be allowed to follow this evaluation procedure.

Sources of information

Osvaldo Cairo Battistuti, Fundamentos de Programación, 2006, Pearson Education

Brian W. Kernighan & Dennis M. Ritchie, El Lenguaje de Programación C, 1995, Prentice Hall

James L. Antonakos & Kenneth C. Mansfield Jr., Programación Estructurada en C, 2004, Prentice Hall

Jorge A. Villalobos S. & Rubby Casallas G., Fundamentos de Programación: Aprendizaje Activo Basado en Casos, 2006, Prentice Hall

, <http://www.Cprogramming.com>, ,

Recommendations

Subjects that continue the syllabus

(*)Programación II/V05G300V01302

Subjects that it is recommended to have taken before

(*)Informática: Arquitectura de ordenadores/V05G300V01103

Other comments

The subject Programming II is a continuation of this subject in the second course.

IDENTIFYING DATA				
(*)Comunicación de datos				
Subject	(*)Comunicación de datos			
Code	V05G300V01301			
Study programme	(*)Grao en Enxeñaría de Tecnoloxías de Telecomunicación			
Descriptors	Credit.	Type	Year	Quadmester
	6	Mandatory	2nd	1st
Language	(*)Castelán			
Department				
Coordinador	Lopez Garcia, Candido Antonio			
Lecturers	Argibay Losada, Pablo Jesus Fernandez Veiga, Manuel Lopez Garcia, Candido Antonio Sousa Vieira, Estrella Suarez Gonzalez, Andres			
E-mail	candido@det.uvigo.es			
Web				
General description	(*)In this matter will analyse the efficiency and reliability of the transmission of data on discreet channels without memory, and will enter :* the methods of compression of data without losses,* the codes of control of linear errors and *cíclicos,* the protocols of link of data, and* the protocols and technologies of the channels of multiple access.			

Competencies

Code	
A3	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
A4	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.
A20	The ability to conceive, deploy, organize and manage networks, systems, services and Telecommunication infrastructures in residential (home, city, digital communities), business and institutional environments, being responsible for launching of projects and continuous improvement like knowing their social and economical impact.
A26	The knowledge and usage of concepts of communication network architecture, protocols and interfaces
A27	The ability to differentiate the concepts of access and transport networks, packet and circuit switched networks, mobile and fixed networks, as well as distributed newtwork application and systems, voice, data, video, audio, interactive and multimedia services
A29	The knowledge of national, European and international telecommunication regulations and laws.

Learning aims

	Typology	Competences
(*)	know	A3
(*)	Know How	A4
(*)	know	A26 A29
(*)	Know How	A20 A27

Contents

Topic	
(*)	(*)
(*)	(*)
(*)	(*)

(*)

(*)

Planning

	Class hours	Hours outside the classroom	Hores totals
(*) Sesión maxistral	28	0	28
(*) Estudos/actividades previos	0	56	56
(*) Resolución de problemas e/ou exercicios	26	0	26
(*) Resolución de problemas e/ou exercicios de forma autónoma	0	26	26
(*) Resolución de problemas e/ou exercicios	0	12	12
(*) Probas de resposta longa, de desenvolvemento	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
(*) Sesión maxistral	(*) They will expose of systematic form the theoretical contents of the *asignatura, *resaltando the aims, fundamental concepts and relations between the distinct subjects.
(*) Estudos/actividades previos	(*) The student will study the theoretical contents of the *asignatura using the book of text and/or aim them of the same.
(*) Resolución de problemas e/ou exercicios	(*) They will resolve *detalladamente a series of problems and/or exercises *preseleccionados, *resaltando the theoretical concepts involved and the methodology of resolution.
(*) Resolución de problemas e/ou exercicios de forma autónoma	(*) The student will try to resolve of autonomous form a collection of problems and/or exercises proposed.

Personalized attention

	Description
(*) Estudos/actividades previos	(*) The student will be able to consult individually in the hours of *tutorías all the doubts that pose him so much in the study of the theoretical contents and in the autonomous resolution of the problems and/or exercises.
(*) Resolución de problemas e/ou exercicios de forma autónoma	(*) The student will be able to consult individually in the hours of *tutorías all the doubts that pose him so much in the study of the theoretical contents and in the autonomous resolution of the problems and/or exercises.

Assessment

	Description	Qualification
(*) Resolución de problemas e/ou exercicios	(*) The student will have to resolve individually three bulletins of problems, corresponding to the three first subjects of the *temario.	30
(*) Probas de resposta longa, de desenvolvemento	(*) Final examination of the *asignatura.	70

Other comments and second call

(*)

They leave the discretion of the students two methods of alternative evaluation in the subject: continuous evaluation and only evaluation.

The continuous evaluation will consist in the individual resolution was of the hours *presenciais of three groups of problems (each 10% of the final note) more the realization of a @escrito @exame to the term of the *cuatrimestre (#70% of the final note). The billed of the tasks will propose once finished the classes of the three first subjects. To be object of qualification, the solutions will owe to present before *transcorridos 7 days #since his publication and will be zoned and given back in a maximum term of fifteen days. The qualification of the tasks only supplies effects in the course in that propose .

The only evaluation will consist in a @escrito @exame envelope the contents of the subject. The final qualification of the subject will be, in this case, the note obtained in the @exame.

They will consider presented to the announcement all the students that delivered the three tasks of continuous evaluation or that assist to the @exame. The way of evaluation (continuous or only) will choose in the act of the @exame, exercise *cuxo billed will be the same in both cases.

Whom do not surpass the subject in the first opportunity *disporá of a second opportunity in the month of July *consistente in answering it an only @escrito @exame. It will apply to the students to form of evaluation (continuous or only) that choose in the moment of the @exame.

Sources of information

C. López García, M. Fernández Veiga, Teoría de la Información y Codificación, 2002, Tórculo edicions

C. López García, M. Fernández Veiga, Cuestiones de Teoría de la Información y Codificación, 2003, Tórculo edicions

K. Sayood, Introduction to Data Compression, 3/e, 2006, Morgan Kaufmann

J. F. Kurose, K. W. Ross, Computer Networking, 5/e, 2010, Addison Wesley

Recommendations

Subjects that continue the syllabus

(*)Redes de ordenadores/V05G300V01403

Subjects that it is recommended to have taken before

(*)Matemáticas: Probabilidade e estadística/V05G300V01204

IDENTIFYING DATA				
(*)Programación II				
Subject	(*)Programación II			
Code	V05G300V01302			
Study programme	(*)Grao en Enxeñaría de Tecnoloxías de Telecomunicación			
Descriptors	Credit.	Type	Year	Quadmester
	6	Mandatory	2nd	1st
Language	(*)Castelán			
Department				
Coordinador	Diaz Redondo, Rebeca Pilar			
Lecturers	Alvarez Sabucedo, Luis Modesto Caeiro Rodriguez, Manuel Diaz Redondo, Rebeca Pilar Fernandez Vilas, Ana Ramos Cabrer, Manuel			
E-mail				
Web	http://www.faitic.es			
General description	<p>The overall objective of the course is to provide students with the theoretical and practical skills that allow you to analyze, design, develop and debug applications following the object-oriented paradigm.</p> <p>This is a very practical subject and here is aimed at students' work in carrying out one or more projects. To facilitate the development of projects in the course also provides an introduction to the "Software Engineering". In this sense it covers all phases generally recognized in the processes of software development ranging from requirements capture and description to the deployment of the systems, but it essentially involves the stages of analysis, design, implementation and debugging.</p> <p>First we present the software engineering discipline is essential for the development of large computer applications, showing the main challenges it faces and the basic concepts that will be used. Then we will analyze the elements of object-oriented paradigm using UML elements and diagrams that will be used by students in their developments. To achieve this overall objective will be content that the subject can be summarized in the following items:</p> <ol style="list-style-type: none">1. Object-Oriented Paradigm and basics of object orientation: classes and objects<ol style="list-style-type: none">1.1 Encapsulation. Principle of concealment. Concepts of decoupling and cohesion1.2 Inheritance, abstraction, polymorphism and reuse1.3 Relationship between classes: generalization, association and dependency1.4 Communication between objects, methods, events, messages1.5 Persistence of data.1.6 Generation, capturing and processing exceptions2. Introduction to Software Engineering<ol style="list-style-type: none">2.1 Basics of Software Engineering. O Introduction and Historical Life Cycle concept. Standard ISO / IEC 122072.2 Introduction to software development methodologies. Introduction to Classification or development processes, object-oriented software. Metric v3 and the Unified Process2.3 Main phases of OO development: analysis, design, implementation and testing2.4 Introduction to UML modeling language: structure and interaction			

Competencies	
Code	
A6	The aptitude to manage mandatory specifications, procedures and laws.
A9	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
A59	(*)(*CE50/*T18) Capacity to develop, interpret and debug programs using the basic concepts. Of the Programming Oriented to Objects (*POO): classes and objects, encapsulation, relations between classes and objects, and inheritance.
A60	(*)(*CE51/*T19) Capacity of basic application of the phases of analysis, design, implementation and *depuración of programs in the *POO.
A61	(*)(*CE52/*T20) Capacity of handle of tools MARRY (editors, debuggers).

A62 (*)(*CE53/*T21) Capacity of development of programs attending to the basic principles of quality of the engineering of the software, taking into account the main existent sources in norms, standard and specifications.

B5 The ability to use software tools to search for information or bibliographical resources

Learning aims		
	Typology	Competences
Describe the programming model that supports object-oriented paradigm.	know	A60
List the basic principles of object-oriented paradigm.	know	A60
Interpret a class hierarchy for a specific domain.	Know How	A60
Describe the benefits of encapsulation	know	A60
Describe in a specific context, the usefulness of polymorphism and overloading.	know	A60
State the correspondence between the concepts of object-oriented paradigm and Java programming language.	Know How	A60 A62
Build a model using UML use cases from a textual description of a problem to solve.	Know How	A60 A62
Build a model of analysis using UML classes from a textual description of the domain analysis and objective system	Know How	A60 A62
Build a model of class design using UML model from the target system analysis.	Know How	A60 A62
Build a set of interaction diagrams to articulate a use case from the use case specification and design class diagram.	Know How	A60 A62
The syntax and semantics of the Java programming language.	know	A60 A62
Write Java code that implements a software solution from the detailed design of the same (UML).	Know How	A59 A62
Detecting and correcting errors in a Java program using the debugging facilities of a software development environment.	Know How	A60 A61
List and describe the basic activities in a process of object-oriented development with UML.	know	A60 A62
Evaluate the functionality and potential of a CASE tool for a particular software problem	Know How	A61
Use a CASE tool for coding and debugging source code.	Know How	A61
Coordinated work in a team	Know How	A9
Get an idea clearly and concisely	Know How	A9
Locate online resources in an autonomous way to solve an identified problem and local character.	Know How	B5
(*)Exchange information with other developers of the community by means of the use of usual on-line tools in the field.	Know How	B5
Understand the most important standards in software engineering	know	A6
Identify the steps described in the specifications for software engineering	know	A6
Explain the motivation of software engineering standards	know	A6
Explain the concept of emergency, the different types and their application in programming	know	A59
Use the classes representing exceptions in Java and the main methods	Know How	A59
Enter statements that address the release and capture of exceptions in Java programs	Know How	A59
Knowing the different mechanisms of input / output programming associated with high-level languages	know	A59
Understand and differentiate static structures and dynamic data storage typically used in the design and development of programs of medium complexity	know	A59
Ability to use packet input / output and data storage Java	Know How	A59
Knowing how to manage libraries of generic classes for data collections in Java	Know How	A59
Ability to apply the concept of object serialization in Java	Know How	A59
Understanding the mechanisms of visibility, the references between objects and object creation mechanisms	know	A59
Knowing the event paradigm and the concept of event-driven program	know	A59

Contents

Topic

1. Introduction to OO paradigm	<ul style="list-style-type: none"> a. Brief introduction to the subject and your organization b. Birth of the paradigm c. Bases: classes and objects d. Concepts of encapsulation, inheritance (generalization), and polymorphism e. Brief Introduction to UML and PUM
2. Basic resources in Java	<ul style="list-style-type: none"> a. Program structure. JVM. b. Articulation in Java: <ul style="list-style-type: none"> i. Types, variables and scope definition, operators ii. Pointers iii. Control Structures iv. Functions c. File input / output
3. Encapsulation	<ul style="list-style-type: none"> a. Classes, interfaces and packages b. Methods and member variables. Visibility. Resolution field. c. Constructor and destructor methods
4. Object Manipulation	<ul style="list-style-type: none"> a. Passing parameters: pointers and references b. Pointers to objects c. Use of dynamic structures (lists, arrays)
5. Inheritance	<ul style="list-style-type: none"> a. Derived classes and types of inheritance b. Abstract Classes c. Multiple Inheritance
6. Object-Oriented Design	<ul style="list-style-type: none"> a. Design Basics b. Use of UML diagrams
7. File input / output in Java	<ul style="list-style-type: none"> a. Inflows / output b. File Streams c. String Streams d. Object serialization
8. Polymorphism	<ul style="list-style-type: none"> a. Overloading and overriding b. Abstract classes and interfaces
9. Exception Handling	<ul style="list-style-type: none"> a. Exception Basics b. Handling java exceptions
10. Software Development Process	<ul style="list-style-type: none"> a. Life Cycle b. Unified Process Software Development c. CASE tools

Planning

	Class hours	Hours outside the classroom	Hores totals
(*) Sesión maxistral	28	42	70
(*) Resolución de problemas e/ou exercicios	9	9	18
(*) Presentacións/exposicións	1	1	2
(*) Resolución de problemas e/ou exercicios de forma autónoma	5	10	15
(*) Proxectos	7	31	38
(*) Probas prácticas, de execución de tarefas reais e/ou simuladas.	2	0	2
(*) Estudo de casos/análise de situacións	0	1	1
(*) Resolución de problemas e/ou exercicios	2	0	2
(*) Probas prácticas, de execución de tarefas reais e/ou simuladas.	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
(*) Sesión maxistral	Classes that combine lecture session exposure of the concepts to be discussed at the subject with the performance of small exercises. These may be resolved by the teacher or the students themselves individually and / or groups. The aim is to encourage discussion in class and reinforce the acquisition of skills.
(*) Resolución de problemas e/ou exercicios	In the lab, the teacher will pose challenges to be resolved small so they can collectively discuss the concepts underlying the various options for resolution and that students acquire the skills objective of the course.
(*) Presentacións/exposicións	Students will be exposed to their peers in the laboratory raised design software system to solve the objective of the project to be carried out during the second part of the course. Comparing the different proposals shall address the best options and serve as feedback for, if appropriate, to improve the designs.
(*) Resolución de problemas e/ou exercicios de forma autónoma	Students independently solve the problems that the teacher raised in the laboratory. Solutions and doubts that arise in addressing these problems will be put together to agree the best way to resolution.
(*) Proxectos	Each student will implement the software system individually raised by the teacher. Have to do the second part of the course combines classroom work in the lab with individual work.

Personalized attention	
	Description
(*) Resolución de problemas e/ou exercicios de forma autónoma	Individual attention will be coordinated with monitoring the work of each student, monitoring the solutions posed for each problem, exposing them to perform their peers and monitor the project to be implemented.
(*) Resolución de problemas e/ou exercicios	Individual attention will be coordinated with monitoring the work of each student, monitoring the solutions posed for each problem, exposing them to perform their peers and monitor the project to be implemented.
(*) Presentacións/exposicións	Individual attention will be coordinated with monitoring the work of each student, monitoring the solutions posed for each problem, exposing them to perform their peers and monitor the project to be implemented.
(*) Proxectos	Individual attention will be coordinated with monitoring the work of each student, monitoring the solutions posed for each problem, exposing them to perform their peers and monitor the project to be implemented.

Assessment		
	Description	Qualification
(*) Proxectos	Each student individually deliver the software project during the last week of teaching period. This will consist of final design (UML diagrams), the generated code and documentation explaining the implementation. Given that the code can be compiled and run on computers in the teaching laboratories is key to overcoming this assessment. Teachers valued in the same proportion the operation of code delivered by a battery of tests and the design used for implementation.	15
(*) Probas prácticas, de execución de tarefas reais e/ou simuladas.	Around week 7 of the teaching period, each student will individually test programming skills lab equipment. This test also will combine the resolution of small cases that require short answers.	10
(*) Estudo de casos/análise de situacións	Students organized into groups of 2, will deliver the design of a software project. Be given approximately 10 weeks of teaching period.	10
(*) Resolución de problemas e/ou exercicios	Troubleshooting and / or exercises, individual written exam, held on the date approved by this School Board, consisting of the combination of the following types of questions: problem solving, short to resolve issues by applying theoretical concepts explained in class, reasonably justified if one or more statements are true or false, small tests of the theory and application. Not allowed to use notes, books or collections of problems. The number and combination of these questions will be set for each particular test.	50
(*) Probas prácticas, de execución de tarefas reais e/ou simuladas.	Practical tests, performance of real tasks and / or simulated. This test will take place on the date set by the School Board to do so. Individually each student will conduct a review of programming skills in a practical setting (lab teacher at the center).	15

Other comments and second call

The evaluation of the subject can follow the stream of continuous assessment or a final exam. In any case, the subject is

considered passed if the student earns a grade less than five (5) on a total of ten (10) possible points.

Continuous assessment consists of the points mentioned above. Evaluation by final examination will consist of two parts: an examination of programming in the lab and written exam in the classroom, both parties will contribute to the final in the same medium, 50%. Both tests agree in their description with the last two rounds of continuous assessment, as described above. The tests may not be recoverable.

The student chooses the continuous assessment at the time that the software project is presented in the last week of teaching period, from the time the note may never be "not presented". For the call of July and all the extraordinary does not apply continuous assessment, so that all students will benefit from the type of final exam.

The marks obtained in the intermediate tests are not maintained from one course to another.

Sources of information

Basic manuals

- [1] "Introduction to Java programming". And. Daniel Liang, 8ª edition. 2010, Pearson.
- [2] "Open-oriented Analysis and Design with Applications". Grady Booch, Robert Maksimchuk, Michael Engel, Bobbi Young, Jim Conallen, Kelli Houston, 3ª edition. 2007, Addison Wesley.
- [3] "The Java Tutorial. To Short course on the basics". Sharon Zakhour, Scott Hommel, Jacob Royal, Isaac Rabinovitch, Tom Risser, Mark Hoeber, 4ª edition. 2006, Prentice-Hall.

Additional references

- [1] "Engineering of the Software oriented to objetoscon UML, Java and Internet". Alfredo Weitzenfeld. 2005, Thomson.
- [2] "UML for programmers JAVA". Rober C. Martin. 2004, Pearson.
- [3] "It Dates Structures & Algorithms in Java". Michale T. Goodrich, Roberto Tamassia, 5ª edition. 2010, Wiley.
- [4] "Java Tools". Andreas Eberhart, Stefan Fischer. 2002, Wiley
- [5] "Java In To Nutshell". David Flanagan, 5ª edition. 2005, O'Reilly.
- [6] "Thinking in Java". Bruce Eckel, 4ª edition. 2006, Prentice Hall
- [7] "Learning Java". Patrick Niemeyer, 3ª edition. O'Reilly Half
- [8] "How to Think Like to Computer Scientist. JavaTM Version". 4ª version. On-line:
<http://www.greenteapress.com/thinkajava/>
- [9] "Java notice". Fred Swartz. On-line: <http://www.leepoint.net/notes-java/index.html>
- [10] "Java . Oracle". On-line: <http://www.oracle.com/technetwork/java/javase/downloads/index.html>
- [11] "Java 2 Platform Standard Edition 5.0. API Specification". On-line:
<http://download.oracle.com/javase/1.5.0/docs/api/>
- [12] "The Java Tutorials". Oracle. On-line: <http://download.oracle.com/javase/tutorial/>
- [13] "Object-Oriented Analysis and Design with Applications". Grady Booch. 2011, Addison Wesley.
- [14] "UML Distilled: To Brief Guide to the Standard Object Modeling Language". Martin Fowler. 3ª edition.
- [15] "The Unified Modeling Language User Guide". Grady Booch. 2ª edition. 2005, Addison Wesley
- [16] "Learning UML 2.0". Russ Miles.
- [17] "UML 2.0 in to Nutshell". Dan Pilone. O'Reilly
- [18] "Fundamentals of Object-oriented design in UML". Meilir Page-Jones. 2002, Addison Wesley.
- [19] "UML and the Unified process: practical object-oriented analysis & design". Jim Arlow, Ila Neustadt. 2002, Addison Wesley

[20] “ *UML and Patterns: an introduction to the *análisisy design oriented to objects and to the process unified” . Craig
*Larman, 2ªedition. 2003, *Pearson.

Recommendations

Subjects that it is recommended to have taken before

(*)Programación I/V05G300V01205

IDENTIFYING DATA				
(*)Transmisión electromagnética				
Subject	(*)Transmisión electromagnética			
Code	V05G300V01303			
Study programme	(*)Grao en Enxeñaría de Tecnoloxías de Telecomunicación			
Descriptors	Credit.	Type	Year	Quadmester
	6	Mandatory	2nd	1st
Language	(*)Castelán (*)Galego			
Department				
Coordinador	Vera Isasa, Maria			
Lecturers	Arias Acuña, Alberto Marcos Fernandez Hermida, Xulio Garcia-Tuñon Blanca, Ines Gomez Araujo, Marta Gómez Pérez, Paula Lorenzo Rodríguez, María Edita de Nuñez Ortuño, Jose Maria Rubiños Lopez, Jose Oscar Torio Gomez, Pablo Vera Isasa, Maria			
E-mail	mirentxu@uvigo.es			
Web	http://fatic.uvigo.es			
General description	Fundamentals of electromagnetic guided and unguided transmission. Analysis of the operating principles of different transmission media models and their characterization in telecommunication engineering.			

Competencies	
Code	
A3	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
A4	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.
A5	The knowledge to perform measurements, calculations, assessments, appraisals, technical evaluations, studies, reports, task scheduling and similar work to each specific telecommunication area.
A17	The ability to use software tools for bibliographical resources search or information related with electronics and telecommunications
A18	The ability to analyze and specify the main parameters of a communications system.
A19	The ability to evaluate the advantages and disadvantages of different technological alternatives in the implementation and deployment of communication systems from the point of view of signals, perturbations, noise and digital and analogical modulation systems

Learning aims		
	Typology	Competences
Identify and define the main parameters that characterize transmission media of electromagnetic waves.	know	A3 A17 A18
Solve problems that require the handling of basic concepts related to guided and radio transmission.	Know How	A4 A17 A18 A19
Make estimates of transmission losses in the different media.	Know How	A3 A5 A18 A19

Contents

Topic	
1. Introduction	Types of transmission media, advantages and disadvantages, characterisation.
2. Transmission Lines	Electromagnetic characterisation, equivalent circuit, general equations, parameters. Transmission line in circuit (reflection coefficient, standing wave ratio). Getting to some of the most commonly used transmission lines. Training in the use of Smith Chart. Knowledge of different adaptation techniques.
3. Optical fibre	Structure. Principles of light propagation. Cone of acceptance. Light Dispersion. Knowledge of different types of fibers and connectors.
4. Radiowaves Characteristics	Antenna concept, far field, radiation integral .
5. Fundamental parameters	Radiation pattern and related parameters (SLL, BW), gain, polarisation, impedance.
6. Friis transmission formula	Power balance in free space, polarisation loss factor.
7. Radio-systems evaluation.	Systems limited in power and interference. S/N, C/I. Noise Factor of the system. Threshold and nominal power. Availability.

Planning

	Class hours	Hours outside the classroom	Hores totals
(*)Actividades introductorias	2	2	4
(*)Sesión maxistral	22	33	55
(*) Resolución de problemas e/ou ejercicios	4	6	10
(*) Prácticas de laboratorio	16	16	32
(*)Resolución de problemas e/ou ejercicios de forma autónoma		12	18
(*)Resolución de problemas e/ou ejercicios	4	10	14
(*)Probas de resposta curta	2	5	7
(*)Informes/memorias de prácticas	0	10	10

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

Methodologies

	Description
(*)Actividades introductorias	Activities directed to take contact and gather information on the students and to present the matter.
(*)Sesión maxistral	Presentation by the teacher of the contents of the subject of study (theoretical basis).
(*) Resolución de problemas e/ou ejercicios	Exercises related to the subject as a complement to the lecture. The teacher shows how to apply the learned information and procedures to solving problems. The student must interpret the results.
(*) Prácticas de laboratorio	Application of knowledge to concrete situations and acquisition of basic skills and procedurals in the related field. Are developed in laboratories with specialized equipment.
(*)Resolución de problemas e/ou ejercicios de forma autónoma	Activity in which problems are formulated related to the subject. The student must develop the analysis and solving problems independently. Are conducted in small groups with personal attention from teachers.

Personalized attention

	Description
(*)Sesión maxistral	Students will have the opportunity to attend personalized tutoring in the schedule that teachers establish for this purpose at the beginning of the course and will be published on the website of the course. The teacher will go resolving in the classroom the doubts that arise in the moment of the class and in the tutoring schedule those that arise when realising the autonomous study.

(*) Resolución de problemas e/ou exercicios	Students will have the opportunity to attend personalized tutoring in the schedule that teachers establish for this purpose at the beginning of the course and will be published on the website of the course. The teacher will go resolving in the classroom the doubts that arise in the moment of the class and in the tutoring schedule those that arise when realising the autonomous study.
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Assessment		
	Description	Qualification
(*) Prácticas de laboratorio	It will value the active participation and the correction in the realisation of the practices.	10
(*) Probas de resposta curta	Tests for evaluation of acquired skills including direct questions about a particular aspect. Students must respond directly and brief based on the knowledge they possess on the subject.	40
(*) Resolución de problemas e/ou exercicios	Proof in which the student has to solve a series of problems in a time and conditions established by the teacher, applying knowledge acquired.	40
(*) Informes/memorias de prácticas	Preparation of documents that reflect the work done in the practices.	10

Other comments and second call

Continuous assessment comprises a series of tasks performed during the course (60%) and short-answer test (40%) that is performed corresponding day according to the official exam schedule.

The tasks in the course include the laboratory practices, their corresponding reports and two tests of problem solving (the first midway through the semester and the second towards the end). These tasks are not recoverable, ie if a student can not fulfill on time the teacher has no obligation to repeat and will only be valid for the academic year in which they are made.

Evaluation by final exam

In addition to the continuous assesment system described above, the student may choose to perform one final exam that will have two parts:

Part I: short-answer test (40%).

Part II: Problem Solving (60%).

The student must decide if opts for the ongoing evaluation after the realization of the first test of problem solving on the 8 th -9 th week of class, in which case they receive a grade that corresponds, independently that he presents to other tests or not.

July exam

Consist of a final exam with the same characteristics and weights as indicated in the previous section.

Students who want to preserve the mark obtained in laboratory practices (20%) and in two tests of problem solving (40%) may elect to perform only the first part of the exam (40%).

To pass the subject at least 50% in the total qualification must be obtained in any of the evaluation systems and calls.

Sources of information

D. K. Cheng, Fundamentos de electromagnetismo para ingeniería, , 1997

J.D. Kraus, Electromagnetics with applications, 5ª, 2000

S.V. Marshall, R.E. DuBroff, G.G. Skitek, Electromagnetic concepts and , 4ª, 1997

N. N. Rao, Elements of Engineering Electromagnetics, 6ª, 2004

Additional bibliography:

D.K. Cheng. **Field and Wave Electromagnetics**. Addison-Wesley, 2ª ed.,1989.

C.T. IT. Johnk. **Ingeniería Electromagnetic. Fields and Waves**. Ed.Limusa 1992.

S. Bouquet, J.R. Whinnery and T. Duzer. **Fields and Waves in Communication Electronics**. Wiley, 3ª ed. 1994.

F.T. Ulaby, **Fundamentals of Applied Electromagnetics**, Prentice Hall, 2004.

Recommendations

Subjects that it is recommended to have taken before

(*)Física: Campos e ondas/V05G300V01202

(*)Matemáticas: Cálculo I/V05G300V01105

(*)Matemáticas: Cálculo II/V05G300V01203

IDENTIFYING DATA				
(*)Procesado dixital de sinais				
Subject	(*)Procesado dixital de sinais			
Code	V05G300V01304			
Study programme	(*)Grao en Enxeñaría de Tecnoloxías de Telecomunicación			
Descriptors	Credit.	Type	Year	Quadmester
	6	Mandatory	2nd	1st
Language	(*)Castelán			
Department				
Coordinador	Abreu Sernandez, Maria Victoria			
Lecturers	Abreu Sernandez, Maria Victoria Alonso Alonso, Ignacio Garcia Mateo, Carmen			
E-mail	vabreu@uvigo.es			
Web	http://fatic.uvigo.es			
General description	<p>Digital signal processing is nowadays a feature of most everyday communications and entertainment devices. The aim of this course is to equip students with a mathematical grounding in general signal and systems analysis. In subsequent course subjects, this knowledge will be applied to specific applications of signals and systems, including audio, image, video and voice signals.</p> <p>Objectives cover the following areas:</p> <ul style="list-style-type: none"> • Managing signals and systems mathematically and visually, including learning and applying their properties. • Studying the different domains for signal and systems analysis: time domain, frequency domain and Z domain. • Learning how to transfer a problem in one domain to a domain in which it is easier to solve. • Mastering the concept of filter frequency response and learning to interpret the system function. • Understanding the relationship between the poles and zeros of the system function and the frequency response. • Acquiring basic notions of filter design in the Z domain. • Managing specific digital signal processing software. • Applying the above knowledge to simple and practical laboratory examples, including filtering, FFT, windowing and sampling of image and sound signals and touch-tone telephone systems. 			

Competencies	
Code	
A3	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
A4	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.
A57	(*)(*CE48/*T16) Knowledge of the suitable technicians for the development and the exploitation of subsystems of processed of signal.
A58	(*)(*CE49/*T17) Capacity to analyse diagrams of processed digital of signals.

Learning aims		
	Typology	Competences
Managing specific software for digital signal processing	Know How	A57
Applying mathematical knowledgements for signal filtering	know	A58
Mastering filtering operations in frequency domain.	know	A3 A58
Learning mathematical issues for understanding the processes of sampling and windowing signals.	Know How	A4 A57
Analysis of simple processing systems.	Know How	A58

Contents	
Topic	
1. Introduction	Course presentation: programme, reading materials, teaching methodology and assessment system
2. Sinusoids	Sinusoids and complex exponentials signals. Phasor addition rule. Adding sinusoids of the same frequency.
Project 1. Sinusoids with Matlab	Introduction to Matlab. Signals illustration. Adding sinusoids of the same frequency.
3. Spectrum representation	Spectrum of a sum of sinusoids. Harmonically related sinusoids. Multiplication of sinusoids. AM signal. Fourier Series.
Project 2. Fourier series	Complex and real exponentials. Phasor addition rule. Fourier series.
4. Introduction to sampling	Sampling. Ideal A/D conversion. Nyquist Theorem. Aliasing. Ideal D/A conversion. Linear interpolation. Ideal interpolation.
Project 3. A/D and D/A conversion	Sampling and reconstruction of a DTFM signal. Aliasing. Signal reconstruction with a triangular signal. Nyquist theorem and decoding system.
5. Introduction to FIR filters	Difference equations. Filter coefficients. Block diagrams. Causality, linearity and time invariance. LTI systems and convolution.
6. Frequency response of FIR filters	Sinusoidal response of FIR filters. Frequency response. Digital processing of a sampled continuous-time signals.
Project 4. FIR filter	Conv, filter, freqz commands. FIR filter introducing an echo. Bidimensional filter with conv2. DTFM decoding with a band-pass filter bank. Noise.
7. z-Transform	Definition and properties. Convolution. Zeros and poles of a FIR filter. Useful filters in z domain.
8. Introduction to IIR filters	Difference equation. Filter coefficients. Block diagram. Stability. Poles and zeros location and frequency response. Impulse response. The inverse z-Transform. Partial fractions expansion. IIR filtering of various signals.
Project 5. Pole-zero plot	FIR and IIR filters. Zplane and roots commands. Filter analysis with fvtool.
9. Spectrum of discrete-time signal: DTFT, DFT and FFT	DTFT and IDTFT definition. Properties. DFT and IDFT definition. Properties. Relation of these transforms. Windowing. Rectangular window. Spectrum of a windowed signal.
Project 6. FFT	DFT and FFT. Filter response with fft. Spectrum of a windowed signal.
10. Spectrum of a continuous-time signal and sampling theorem	CTFT definition. Basic transform pairs. Comparison between continuous and discrete signals and systems. Properties. Comparison between Fourier transforms. Review of Nyquist theorem, aliasing and A/D, D/A conversion. Amplitude quantization and bit rate.
Project 7. A/D conversion and quantization	Speech signal recording with Matlab. Bit rate and amplitude quantization. Sinusoids aliasing. Listening tones.

Planning			
	Class hours	Hours outside the classroom	Hores totals
(*)Actividades introductorias	1	0	1
(*)Sesión maxistral	23	46	69
(*) Prácticas de laboratorio	14	28	42
(*) Resolución de problemas e/ou ejercicios	12	18	30
(*)Foros de discusión	0	2	2
(*)Resolución de problemas e/ou ejercicios	6	0	6
*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.			

Methodologies	
	Description
(*)Actividades introductorias	Course presentation: programme, reading materials, teaching methodology and assessment system

(*) Sesión maxistral	<p>Instructor presentation of the main concepts of each subject.</p> <p>Classes do not cover all content that is examination material. The student should take the content indicated in the guidelines for each subject into account as orientation for exams.</p> <p>During the 5 minutes before the lecture, a student will summarize the main concepts presented in the previous session.</p> <p>Students will participate by answering questions during the explanation and by doing exercises.</p> <p>Student will work alone afterwards on the concepts studied in class and on expanding this content using the guidelines provided for each subject.</p> <p>Identification of doubts that need to be resolved in personalized tutorials.</p>
(*) Prácticas de laboratorio	<p>Application of Matlab functions and commands for digital signal processing to solving practical exercises.</p> <p>Identification of doubts that need to be resolved in personalized tutorials.</p>
(*) Resolución de problemas e/ou ejercicios	<p>Problems and exercises formulated according to the content of the lectures and the guidelines for each subject.</p> <p>Students solve problems and exercises prior to the class in which one or several students explain the solution on the board.</p> <p>Identification of doubts that need to be resolved in personalized tutorials.</p>
(*) Foros de discusión	<p>The website for the course is included in the TEMA platform (http://fatic.uvigo.es). Subscription to this platform, including a photograph, is mandatory. The website provides all the information related to the course. It also publishes continuous assessment grades and runs forums for students to exchange ideas and discuss doubts.</p>

Personalized attention

	Description
(*) Sesión maxistral	<p>Students will have the opportunity to attend personal tutorials in their lecturer's office at times established by lecturers for this purpose at the beginning of the academic year and published on the course website.</p> <p>These tutorials are aimed at resolving student doubts and providing guidance regarding:</p> <ul style="list-style-type: none"> • The content of the lectures and approaches to study. • Laboratory projects and the software used. • Problems and exercises proposed and solved in the classroom as well as other problems and exercises arising during the course.
(*) Prácticas de laboratorio	<p>Students will have the opportunity to attend personal tutorials in their lecturer's office at times established by lecturers for this purpose at the beginning of the academic year and published on the course website.</p> <p>These tutorials are aimed at resolving student doubts and providing guidance regarding:</p> <ul style="list-style-type: none"> • The content of the lectures and approaches to study. • Laboratory projects and the software used. • Problems and exercises proposed and solved in the classroom as well as other problems and exercises arising during the course.
(*) Resolución de problemas e/ou ejercicios	<p>Students will have the opportunity to attend personal tutorials in their lecturer's office at times established by lecturers for this purpose at the beginning of the academic year and published on the course website.</p> <p>These tutorials are aimed at resolving student doubts and providing guidance regarding:</p> <ul style="list-style-type: none"> • The content of the lectures and approaches to study. • Laboratory projects and the software used. • Problems and exercises proposed and solved in the classroom as well as other problems and exercises arising during the course.

Assessment

	Description	Qualification
(*) Sesión maxistral	In the 5 minutes before the lecture, a student will summarize the main content of the 0 previous session. The lecturer will discuss this summary, focusing on aspects that need to be improved or expanded further.	
(*) Resolución de problemas e/ou ejercicios	Students will present solutions for exercises and problems on the board. The lecturer 0 will discuss the method used and explain possible alternative approaches, highlighting the pros and cons of each.	

(*)Resolución de problemas e/ou exercicios	<p>Continuous assessment consists of 3 x 50-minute tests held in class time, representing 25%, 35% and 40% of the final grade. Between 30% and 40% of the grade for each test will correspond to laboratory practicals.</p> <p>There will be no second opportunity to take these tests. If the student does not sit the test on the agreed date, there is no option for the teacher to repeat the test.</p> <p>Student must also pass a 55-minute basic knowledge test, for which the pass grade is 7 out of 10. The knowledge to be evaluated in this test are specified in the guidelines for each subject.</p> <p>Students may do continuous assessment and also sit for the final exam.</p>	100
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Other comments and second call

1. Basic knowledge test

- The objective of this test is to determine whether the student has acquired the minimum knowledge and skills needed to pass the course.
- Students are graded as pass or fail. Students must obtain a pass grade in this test in order to pass the course.
- To pass, the student must correctly answer at least 70% of the questions.
- There are 3 opportunities to pass this test: in an hour of classroom time in the second-last week of the course, in the January exam period and in the July exam period. A pass grade is valid for the entire academic year.
- If a fail grade is obtained, the numerical score obtained by the student is $\min \{(5 / 7) * \text{BasicKnowledgeGrade}, \text{max} \{ \text{ContinuousAssessmentGrade}, \text{FinalExamGrade} \} \}$.
- Students may not use books, notes or a calculator for this test.
- The test, which lasts about an hour, usually consists of 10 sections including multiple-choice questions and short theoretical and practical questions. Note that this structure may change. Around 20% of the exam corresponds to questions on laboratory projects.

2. Continuous assessment

The course can be passed with full marks from continuous assessment, with no need to sit the final exam.

Students who sit any of the assessment tests may not be listed as "Not Present".

The weighting and content of each continuous assessment test are as follows:

Assessment 1 (25%):

- Sinusoids. Fourier series expansion. Sampling
- Up to project 2 included
- It will take place during the 6th week of the course.

Assessment 2 (35%):

- All the above plus FIR filters (time and frequency) and Z transforms
- Up to project 4 included
- It will take place during the 11th week of the course.

Assessment 3 (40%):

- All the theory
- Up to project 6 included
- It will take place during the last week of the course.

3. Final exam

- There is a final exam in January and another in July. In the final exam, all content is evaluated according to the information contained in the guidelines for each subject.
- Between 30% to 40% of the exam grade corresponds to problems or issues related to laboratory classes.
- This pass mark for this test is 5 out of 10.
- The final exam usually consists of 3 problems and lasts about 2.5 hours. Note that this structure may change.

3.1 First opportunity to pass the course (January)

- Students can opt for continuous assessment and also take the exam. The note will be the highest of the two grades provided the student has passed the basic knowledge test.
- If the student passes the course in this period, the grade will be final and will become part of their academic record.

- If the student fails the course, a provisional fail grade will be recorded on their academic record along with the grade obtained.
- Students who pass the continuous assessment or final examination in January but receive a fail grade for the basic knowledge test may opt to take the basic knowledge test in July.

3.2 Second opportunity to pass the course (July)

- The July final exam and a basic knowledge test will only be held for students who failed the course in January.
- Students who obtained a pass grade in the basic knowledge test in the previous assessment period will not need to do this test in July.
- The basic knowledge test must be taken by students who obtained a fail in the basic knowledge test in the previous assessment period but who passed the continuous assessment or the final examination in January.
- Both the July exam and the basic knowledge test must be taken by students who obtained a fail grade in the basic knowledge test in the previous assessment period and who failed the continuous assessment or the final exam in January.
- Students who do not sit any of the tests corresponding to this second period will be listed as "Not Present" if this was their situation after the first assessment period.
- Provisional fails will become definitive fails for students who do not present for the second period assessment tests.

4. Other comments

- The grades obtained in the basic knowledge test, the continuous assessment and the January and July exams are only valid for the current academic year.
- The use of books, notes or electronic devices such as phones or computers is not permitted in any test or exam. Mobile phones must be turned off and out of reach of the student. If calculator use is permitted, the calculator must be a conventional scientific calculator. Under no circumstances may calculators be used that allow formulas to be saved or that have libraries that automatically perform operations with complex numbers, calculation of roots, etc.

Sources of information

J.H. McClellan y R.W. Schafer, R, Signal Processing First, Pearson Prentice Hall, 2003

A. Quarteroni y F. Saleri, Cálculo científico con Matlab y Octave, Springer, 2006

M. J. Roberts, Señales y Sistemas, McGraw Hill, 2005

A.V. Oppenheim y R.W. Schafer, Tratamiento de señales en tiempo discreto, Prentice Hall, 2ª edición, 2000

It is recommended to purchase the *Signal Processing First (SPF)* book, as it constitutes the main source of content for the course.

Students will be provided with guidelines for each subject that includes the following sections:

- Theoretical content: The theory that will be evaluated in exams.
- Basic knowledge: Content considered essential for the course and tested by the basic knowledge test described in the section on assessment.
- Problems proposed: A set of problems recommended for each subject.
- SPF vocabulary: A Spanish-English vocabulary with a set of selected terms is included to facilitate reading of the book.

Students will also be provided with a document describing the Matlab content considered essential for the course.

Recommendations

Subjects that continue the syllabus

(*)Fundamentos de son e imaxe/V05G300V01405

(*)Técnicas de transmisión e recepción de sinais/V05G300V01404

Subjects that it is recommended to have taken before

(*)Física: Análise de circuitos lineais/V05G300V01201

(*)Matemáticas: Álgebra lineal/V05G300V01104

(*)Matemáticas: Cálculo I/V05G300V01105

(*)Matemáticas: Cálculo II/V05G300V01203

IDENTIFYING DATA				
(*)Física: Fundamentos de electrónica				
Subject	(*)Física: Fundamentos de electrónica			
Code	V05G300V01305			
Study programme	(*)Grao en Enxeñaría de Tecnoloxías de Telecomunicación			
Descriptors	Credit. 6	Type Basic education	Year 2nd	Quadmester 1st
Language	(*)Castelán			
Department				
Coordinador	Raña Garcia, Herminio Jose Dominguez Gomez, Miguel Angel			
Lecturers	Dominguez Gomez, Miguel Angel Raña Garcia, Herminio Jose Rodriguez Pardo, Maria Loreto			
E-mail	hrana@uvigo.es mdgomez@uvigo.es			
Web	http://fatic.uvigo.es			
General description	(*)The main purpose of this *asignatura is to provide to the student the bases for the understanding and command of the principles of operation of the devices and electronic circuits. Begin with a brief introduction to the electronics so as to provide to the students a global vision. To continuation *imparten basic concepts on the devices and fundamental electronic circuits:· Diodes and circuits with diodes, including concepts like line of load, ideal diodes, *rectificadores, *conformadores of wave, logical circuits, regulators of tension and physical of devices.· Characteristics of the bipolar transistors, analysis of line of load, models of big signal, polarisation.· Similar study to the previous of the *FET, highlighting the *MOSFET.· *Comprobación Of designs of the circuits studied using SPICE. *Montaje And *verificación using electronic instrumentation of laboratory.· Digital logical circuits, doing special upsetting in the technology *CMOS. Basic concepts on logical circuits, investor *CMOS, doors *NOR and *NAND.Also it realises a brief introduction to the optoelectronic and to the basic optoelectronic devices and his principles of operation.On the other hand, in the frame of the *asignatura takes place the first contact of the student with the laboratory of electronics. Thus, the fundamental aim of the practical part of the *asignatura is that the student purchase the bases for a correct handle of the most usual instruments in the laboratories of electronics. The student, to the *finalizar the *asignatura, has to know and know handle properly the instruments of laboratory, has to distinguish and characterise the different components, and have practical skills in the *montaje and measure. Besides it will initiate to the students in the simulation of circuits, so as to enter them to the design assisted by computer.			

Competencies	
Code	
A13	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.
B4	The ability to use software tools that support problem solving in engineering

Learning aims		
	Typology	Competences
(*)Understanding and command of the basic concepts of the physical principles of the semiconductors.	know	A13
(*)Understanding and command of the basic concepts of operation of the electronic and photonic devices.	know	A13
(*)Understanding and command of simple electronic circuits based in the electronic and photonic devices and his applications.	Know How	A13
(*)Understanding and command of the basic concepts of the logical families.	know	A13
(*)Basic knowledges on tools *CAD (*Computer *Aided *Design) for the simulation of electronic circuits.	Know How	B4
(*)Capacity of utilisation of tools *CAD to design simple electronic circuits.	Know How	B4

Contents	
Topic	
(*)Subject 1: Introduction	(*)Electronic systems. The process of design. Integrated circuits.
(*)Subject 2: Diodes and circuits with diodes	(*)Characteristics of the diode. Analysis of the line of load. Ideal model of the diode. Circuits *rectificadores. Circuits *conformadores of wave. Logical circuits with diodes. Regulatory circuits of tension. Linear circuits equivalents in small signal. Basic concepts on semiconductors. Physics of the diode of union.
(*)Subject 3: bipolar Transistors	(*)Operation of the bipolar transistor *npn. Analysis of the line of load of an amplifier in *emisor common. The bipolar transistor *pnp. Models of circuits in big signal. Analysis of circuits with bipolar in big signal.
(*)Subject 4: Transistors of effect field	(*)Transistor *NMOS. Analysis of line of load of an amplifier *NMOS simplified. Circuits of polarisation. Transistors *JFET, *MOSFET of *deplexión and devices of channel *p.
(*)Subject 5: digital logical Circuits	(*)Digital logical circuits. Basic concepts. Electrical specifications of the logical doors. The investor *CMOS. Doors *NOR and *NAND *CMOS.
(*)Subject 6: optoelectronic Devices	(*)Introduction to the optoelectronic. Basic optoelectronic devices. Devices *emisores of light: diodes *LED and *LASER. Devices detectors of light: *Fotorresistencias, photodiodes and phototransistors. Optocouplers.

Planning			
	Class hours	Hours outside the classroom	Hores totals
(*)Actividades introductorias	3	6	9
(*)Sesión maxistral	13	24	37
(*) Resolución de problemas e/ou ejercicios	8	24	32
(*) Prácticas de laboratorio	18	40	58
(*) Probas de tipo test	1	0	1
(*)Probas de resposta curta	1	0	1
(*)Resolución de problemas e/ou ejercicios	5	0	5
(*)Probas prácticas, de execución de tarefas reais e/ou simuladas.	7	0	7
*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.			

Methodologies	
	Description
(*)Actividades introductorias	(*)It takes of contact and presentation of the *asignatura. Presentation of the practices of laboratory and of the instrumentation and software to use.
(*)Sesión maxistral	(*)Exhibition by part of the professor of the contents on the matter object of study. Back personal work of the student reviewing the concepts seen in the classroom and preparing the subjects on the bibliography proposed. Identification of doubts that require to be resolved in *tutorías *personalizadas.
(*) Resolución de problemas e/ou ejercicios	(*)Activity in which formulate and resolve problems and/or exercises related with the *asignatura. I complement of the sessions *magistrales. Personal work of the student with resolution of problems and/or exercises proposed in the classroom and of other extracted of the bibliography. Identification of doubts that require to be resolved in *tutorías *personalizadas.
(*) Prácticas de laboratorio	(*)Activities of application of the theoretical knowledges purchased. It will learn to handle the typical instrumentation of a laboratory of electronics and will realise *montajes of basic electronic circuits seen in the sessions *magistrales. Also they will purchase skills of handle of tools of simulation. Personal work of the student preparing the practices using the available documentation and reviewing the theoretical concepts related, *elaboración and analysis of results. Identification of doubts that require to be resolved in *tutorías *personalizadas.

Personalized attention
Description

(*) Sesión magistral	(*) The students will have occasion of *acudir to *tutorías *personalizadas 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 web of the *asignatura. In said *tutorías will resolve the doubts arisen to the students on the contents *impartidos in the sessions *magistrales and will orient them on and address his study. Also they will resolve the doubts arisen to the students on the problems and/or exercises proposed and resolved in the classroom as well as of other problems and/or exercises that can appear along the study of the *asignatura. They will resolve the doubts arisen to the students on the development of the practices of laboratory, the handle of the instrumentation, the *montaje of the electronic circuits and the software of simulation.
(*) Resolución de problemas e/ou ejercicios	(*) The students will have occasion of *acudir to *tutorías *personalizadas 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 web of the *asignatura. In said *tutorías will resolve the doubts arisen to the students on the contents *impartidos in the sessions *magistrales and will orient them on and address his study. Also they will resolve the doubts arisen to the students on the problems and/or exercises proposed and resolved in the classroom as well as of other problems and/or exercises that can appear along the study of the *asignatura. They will resolve the doubts arisen to the students on the development of the practices of laboratory, the handle of the instrumentation, the *montaje of the electronic circuits and the software of simulation.
(*) Prácticas de laboratorio	(*) The students will have occasion of *acudir to *tutorías *personalizadas 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 web of the *asignatura. In said *tutorías will resolve the doubts arisen to the students on the contents *impartidos in the sessions *magistrales and will orient them on and address his study. Also they will resolve the doubts arisen to the students on the problems and/or exercises proposed and resolved in the classroom as well as of other problems and/or exercises that can appear along the study of the *asignatura. They will resolve the doubts arisen to the students on the development of the practices of laboratory, the handle of the instrumentation, the *montaje of the electronic circuits and the software of simulation.

Assessment

	Description	Qualification
(*) Probas de tipo test	(*) Proofs that will realise in the classroom after each exposed subject in the sessions *magistrales to evaluate the knowledges purchased by the student.	10
(*) Probas de resposta curta	(*) Proofs that will realise in the classroom after each exposed subject in the sessions *magistrales to evaluate the knowledges purchased by the student.	10
(*) Resolución de problemas e/ou ejercicios	(*) Proofs that will realise in the classroom along the course and that will evaluate the competitions of the student to resolve problems and/or exercises on a part of the contents of the *asignatura.	40
(*) Probas prácticas, de execución de tarefas reais e/ou simuladas.	(*) Proofs that will realise in the laboratory along the course on the handle of the instrumentation, *montaje of electronic circuits and simulation. It will evaluate the competitions purchased by the student on the contents of the practices of laboratory of the *asignatura.	40

Other comments and second call

(*)

1. Continuous evaluation

Following the proper guidelines of the *titulación and the agreements of the academic commission will offer to the students that *cursen this *asignatura a system of continuous evaluation.

The *asignatura divides in two parts: theory (6 points) and practical (4 points).

1. The Theory

They will realize 4 proofs of type test and of short questions properly *programadas along the course. These proofs will value of 0 to 10 and the final note of #each of these proofs will be (*NPTT -> Sense Proofs Type Test; NPPC -> Sense Proofs Short Questions):

$$*NPTT = (*NPTT1 + *NPTT2 + *NPTT3 + *NPTT4)/4$$

$$NPPC = (NPPC1 + NPPC2 + NPPC3 + NPPC4)/4$$

They will realize 2 proofs of resolution of problems and/or exercises properly *programadas along the course. These proofs will value of 0 to 10 and the final note will be the average (NPE -> Note of Problems and/or Exercises):

$$NPE = (NPE1 + NPE2)/2$$

The final note of theory (NT) will be:

$$NT = 0,1 \cdot NPTT + 0,1 \cdot NPPC + 0,4 \cdot NPE$$

For power opt by the continuous evaluation the student will have to realize the proofs described previously allowing that are missing how maximum to 2 proofs of type test and of short questions (the note of the proofs to the that are missing will be of 0).

The proofs are not recoverable, is to say, that a student can not assist the day in that are *programadas the professor does not have obligation to repeat them.

1.*b Practical

They will realize 3 practical proofs properly *programadas along the course. These proofs will value of 0 to 10 and the final note of the practical (NP) will be:

$$NP = 0,4 \cdot [(NP1 + NP2 + NP3)/3]$$

For power opt to the continuous evaluation the student owes to realize the 3 practical proofs. The practical proofs are not recoverable, is to say, that a student can not assist the day in that are *programadas the professor does not have obligation to repeat them.

1.*c Sense final of the *asignatura

For power approve the *asignatura owes to obtain a minimum of 1,8 points in theory and a minimum of 1,2 points in practices.

The final note (NF) will be:

If $NT \geq 1,8$ and $NP \geq 1,2 \Rightarrow NF = NT + NP$

If $NT < 1,8$ or $NP < 1,2 \Rightarrow NF = \min \{4,5; NT + NP\}$

2. Final @Exame

The students that do not opt by the continuous evaluation or remove a final note minor that the 5 (*suspense) in the continuous evaluation, will be able to present it a final @exame.

The final @exame will have a theoretical part and another practical. The theoretical part will realize in the dates that establish the *xefatura of studies of the School and will consist in a proof that will be able to have questions type test and/or short questions and/or resolution of problems and/or exercises. This proof will evaluate of 0 to 10 and the final note of theory (NT) will be the note of the proof multiplied by 0,6. The practical @exame will realize in the corresponding laboratory, where imparted the classes of practices, in the dates that establish the *xefatura of studies of the School and will consist in a practical proof that will evaluate of 0 to 10 and the final note of practical (NP) will be the note of the proof multiplied by 0,4.

The students that opt by the continuous evaluation and suspend and present to the final @exame can do it only #aside theoretical or to the practice or to the two. *Conservaráselles The note that remove in the continuous evaluation of the part to the that do not present .

The calculation of the final note of the *asignatura will realize how explains in the *apartado 1.*c.

3. Envelope to announcement of recovery (July)

The announcement of recovery (July) will feature of a theoretical part and another practice with the even format that the

final @exame.

The students that present the this announcement can do it only #aside theoretical or to the practice or to the two.

*Conservaráselles The note that remove in the common announcement (continuous evaluation or final @exame). The final note of each part will be the best of the obtained pole student in the common announcement and it of recovery. The calculation of the final note of the *asignatura will realize how explains in the *apartado 1.*c.

4. *Validez Of the qualifications

The qualifications of the student of the theoretical and practical parts of the *asignatura will be valid only stop the academic course in the that obtain .

Sources of information

Hambley, A. R., Electrónica, 2ª ed., Prentice Hall, 2001

Quintáns, C., Simulación de circuitos electrónicos con OrCAD 16 Demo, Marcombo, 2008

Recommendations

Subjects that continue the syllabus

(*)Electrónica dixital/V05G300V01402

(*)Tecnoloxía electrónica/V05G300V01401

Subjects that it is recommended to have taken before

(*)Física: Análise de circuítos lineais/V05G300V01201

IDENTIFYING DATA				
(*)Tecnoloxía electrónica				
Subject	(*)Tecnoloxía electrónica			
Code	V05G300V01401			
Study programme	(*)Grao en Enxeñaría de Tecnoloxías de Telecomunicación			
Descriptors	Credit.	Type	Year	Quadmester
	6	Mandatory	2nd	2nd
Language	(*)Castelán			
Department				
Coordinador	Valdes Peña, Maria Dolores Raña Garcia, Herminio Jose			
Lecturers	Quintans Graña, Camilo Raña Garcia, Herminio Jose Rio Vazquez, Alfredo del Valdes Peña, Maria Dolores			
E-mail	hrana@uvigo.es mvaldes@uvigo.es			
Web	http://faitic.uvigo.es			
General description	(*)The *asignatura devote to the utilisation of integrated circuits, in particular operational amplifiers, as well as to the following fields: Electronics of Power, Electrotechnics in his slope of electrical installations and to the conversion of photovoltaic solar energy and thermal.			

Competencies

Code	
A23	The ability to analyze and design combinatory and sequential, synchronous and asynchronous circuits and the usage of integrated circuits and microprocessors.
A25	The ability to use different energy sources, especially photovoltaic and thermal ones, as well as the fundamentals of power electronics and electronics
B4	The ability to use software tools that support problem solving in engineering
B5	The ability to use software tools to search for information or bibliographical resources

Learning aims

	Typology	Competences
(*)*CE14/*T9 Capacity of analysis and design of circuits *combinacionales and sequential, synchronous and asynchronous, and of utilisation of microprocessors and integrated circuits.	Know How	A23
(*)*CE16/*T11 Capacity to use distinct sources of energy and especially the solar photovoltaic and thermal, as well as the foundations of the electrotechnics and of the electronics of power.	Know How	A25
(*)*B4 *CG13 Capacity to handle tools software that support the resolution of problems in engineering.	Know How	B4
(*)*CG14 Capacity to use computer tools of research of bibliographic resources or of information.	Know How	B5

Contents

Topic

	Class hours	Hours outside the classroom	Hores totals
(*)Sesión maxistral	18	18	36
(*) Prácticas de laboratorio	22	22	44
(*) Resolución de problemas e/ou ejercicios	6	12	18
(*)Probas de resposta curta	3	15	18
(*)Resolución de problemas e/ou ejercicios	3	15	18
(*)Probas prácticas, de execución de tarefas reais e/ou simuladas.	4	12	16

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

Methodologies

	Description
(*)Sesión maxistral	(*)Exhibition by part of the professor of theoretical contents.
(*) Prácticas de laboratorio	(*)They will realise *montajes of electronic circuits and simulation of circuits by computer.
(*) Resolución de problemas e/ou ejercicios	(*)The professor will resolve exercises in the majority of the subjects.

Personalized attention

	Description
(*)Sesión maxistral	(*)The professor will attend personally doubts and queries of the students, on the study of theoretical concepts, on exercises or on practices of laboratory. The students will have occasion of *acudir to *tutorías *personalizadas 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 *asignatura.
(*) Prácticas de laboratorio	(*)The professor will attend personally doubts and queries of the students, on the study of theoretical concepts, on exercises or on practices of laboratory. The students will have occasion of *acudir to *tutorías *personalizadas 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 *asignatura.
(*) Resolución de problemas e/ou ejercicios	(*)The professor will attend personally doubts and queries of the students, on the study of theoretical concepts, on exercises or on practices of laboratory. The students will have occasion of *acudir to *tutorías *personalizadas 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 *asignatura.

Assessment

	Description	Qualification
(*)Probas de resposta curta	(*)They form part of each partial examination of theory, in which suppose the half of his note. The number of proofs and norms detail in "Other comments".	35
(*)Resolución de problemas e/ou ejercicios	(*)They form part of each partial examination of theory, in which suppose the half of his note. The number of proofs and norms detail in "Other comments".	35
(*)Probas prácticas, de execución de tarefas reais e/ou simuladas.	(*)They realise in the laboratory. They consist in the type of tasks realised or prepared during the practices of the *asignatura: the practical proofs feature of: 1) *montaje real of circuits and answer to measures and questions on both and 2) simulation of equal or similar circuits to the studied in the practices and questions on the same.	30

Other comments and second call

(*)

NOTE: the lengths of the partial proofs specified in this *apartado of evaluation how multiple of half hour -"half hour", "an hour", "two hours"- , understand #aproximate and probably will have to be shortened in a small percentage for power adapt the partial @exame to the length of the sessions of class. During it *cuadrimestre of *docencia of the *asignatura will indicate the exact length.

1. Continuous evaluation:

The evaluation of the *asignatura realizes by means of a continuous evaluation, that consists in partial proofs so much of the theoretical part how of the part of practices of laboratory. Nevertheless it contemplates also the realization of the final

@exame how alternative. They detail the norms to continuation.

1.1. Theoretical @Exame:

They realize two partial @exame, writings, to evaluate the theoretical part. They allow to free parts of the subject stop the final @exame, in the that *tódolos students examine of the final part ("split 3ª") of the *asignatura.

1º partial: copper the block I: since the principle of the *temario until @amplificador *operacionais included. This part weighs a #30% of the final note of the *asignatura.

2º partial: copper the block II: Electronic of *Potencia. It weighs a #20% of the final note of the *asignatura.

"3º partial" (subject to evaluate for *tódolos students in the final @exame): the blocks *III (*Electrotecnia) and *IV (solar Energy). This part weighs a #20% of the final note of the *asignatura.

Of this form, the theoretical @exame weigh a 70% envelope the total of the final note.

The partial (is to say, the 1º and the 2º), realized in hours of class (and of next length the a session of 2 hours) include a half (in time and in punctuation) correspondent to questions of brief answer ("questions") and another half (in time and in punctuation) correspondent to exercises:

- Punctuation of the 1º partial envelope to final note of the *asignatura: 15% questions; 15% exercises.
- Punctuation of the 2º partial envelope to final note of the *asignatura: 10% questions; 10% exercises.
- Punctuation of the "part 3ª" (evaluated in the final @exame): 10% questions; 10% exercises.

To approve a partial @exame @teórico (1º or 2º) the student owes to achieve *alomenos 5 points on 10 in the even.

There are two types of final @exame @teórico:

- The students that approve the two partial will examine only of the *temario correspondent #aside third, in a @exame with the *misma *estructura that the partial: 1 hour for "questions" and 1 hour for exercises.
- The students that do not approve both partial, will do a distinct @exame formed by 1/2 hour of questions and 1/2 hour of exercises by each part of the *asignatura that do not have approved (1ª and/or 2ª and 3ª).

1.2. Evaluation of practices of laboratory:

The practices of laboratory *evalúanse by means of partial @exame *deprácticas and by means of the final @exame of practices of each announcement.

The continuous evaluation of practices of laboratory realizes by means of two partial "@exame" of practices in the laboratory. The first copper the first block of practical (until @amplificador *operacionais included). Stop the students that approve the first partial of practical (sense ≥ 5 on 10), the second partial @exame copper the rest of practices that realize tie the final of the *cuatrimestre and the final note of practices is the average of both. Stop the students that do not approve the first partial of practices, the second "partial @exame" of practical copper to whole of the practices and his final note of practices is it of this according to *examen.

1.3. Students presented:

It understands that the student opts by continuous evaluation realizes the first partial of practices. Since this moment considers presented to the announcement. His qualification of practices will be it of continuous evaluation: the obtained of the partial @exame of second practices describes in the *apartado 1.2.

In academic courses in that celebrate before the first partial @exame theoretical that the @práctico, in accordance with the recently indicated, the assistance to the first partial @teórico does not involve commitment of the student to be evaluated by continuous evaluation: in any case to incorporation to the continuous evaluation, as well as the qualification how presented, depend of the first partial @exame **of practices of laboratory**.

The note of the continuous evaluation of practices ***consérvase stop the @exame of July**.

1.4. Students that approve the *asignatura

To approve the *asignatura considers the "final note *provisional" of the *asignatura, that is:

$$*NotaFinalProvisional = *NotaDeTeoría \times 0,70 + *NotaDePrácticas \times 0,30 ,$$

Being *NotaDeTeoría the note of the @exame of theory expressed on 10 points and

Being *NotaDePrácticas the note of the @exame of practices expressed on 10 points.

A student approves the *asignatura yes his notes fulfil *simultáneamente these two conditions:

(1) *NotaFinalProvisional is main or the same that 5 points on 10;

(2) *NotaDeTeoría and *NotaDePrácticas are both main or equal to 3 points on 10.

If they buy the two conditions, the final note definitive, that *figurará in the *acta, will be the "final note provisional".

If it buy the condition 1) but no to 2), the final note definitive, that will feature in the *acta, will be 4,5.

1.5. Dates *orientativas

The #aproximate date due stop the partial @exame @teórico are the weeks numbers 7 and 13 of the *cuadrimestre (counting only the days of effective class of each group).

The #aproximate date due stop the partial @exame of practices of laboratory are the weeks number 8 and 14 of the *cuadrimestre (counting only the days of effective class of each group).

2. Evaluation by final @exame

The final @exame pole that evaluate the students that do not take part in the continuous evaluation features of theoretical part, that is the same for *tódolos students that do not approve any partial, presented or no it any of @el (norms in *apartado 1.1), and practical part. The weights of the theoretical parts (correspondents to the *temarios of the partial) envelope to "*notafinal provisional" are the same that in the continuous evaluation: #30%, #20% and #20%*respectively. The half of #each of @el stop the questions and the *mitade stop the exercises, of the same form.

The evaluation of practices of the students that do not opt the continuous evaluation realizes by means of a @exame of practices in laboratory in the period of final @exame, in dates fixed in the calendar of final @exame. His length is equal that it of the partial: 2 hours.

The weight of the note of practical envelope to "provisional final note" is the same that stop the students of continuous evaluation: #30%.

To approve the *asignatura in the final @exame establish the *mismas conditions of provisional "final note" and conditions of minimum note of theory and of practices that specify along the *apartado 1.4.

IMPORTANT MOI: The students that do not take part in the continuous evaluation and have foreseen to present to the final @exame of the *asignatura owe to note to assist to the even, putting in communication with the professors of the *asignatura, personally or by *e-mail of the 7 to the 10 of May of 2011. This *preinscripción is necessary to schedule the turns of @exame of laboratory, but is not *vinculante stop the student in the felt @de que there is not *inconveniente in that a student if *preinscriba and finally do not assist.

3. Second announcement (July)

The @exame of second announcement features, the same that the final @exame of *primera announcement (May), of a theoretical @exame and a @exame of practices, in laboratory.

They are applicable to the @exame of second announcement all the *párrafos of the *apartado 2 ("evaluation by final @exame").

To approve the *asignatura in this announcement establish the *mismas conditions of provisional "final note" and conditions of minimum note of theory and of practices that specify along the *apartado 1.4.

In accordance with the indicated more up, the note of practices of the *alumnosque do continuous evaluation keep stop the

second announcement (July). Of the same form, *consérvase stop this announcement to note of practices of the students that presented to final @exame of practices of laboratory in the first announcement (May).

IMPORTANT MOI: Of the even way that indicates in the *apartado 2 stop the *examen final of May, the students that have foreseen to present to the @exame of July owe to note to assist to the even, putting in communication with the professors of the *asignatura, personally or by *e-mail of the 25 to the 28 of June of 2011. This *preinscripción is necessary to schedule the turns of @exame of laboratory, but is not *vinculante stop the student in the felt @de que in the *hay *inconveniente in that a student if *preinscriba and finally do not assist.

Sources of information

Hambley, A. R., Electrónica, Prentice-Hall, 2ª ed. en español, 2001

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CENSOLAR, Valores medios de irradiación sobre suelo horizontal. Base de datos internacional. H-WORLD., , 1993

Quintáns Graña, C., Simulación de circuitos con OrCAD 16 DEMO, Marcombo, 2008

Recommendations

Subjects that it is recommended to have taken before

(*)Física: Fundamentos de electrónica/V05G300V01305

Other comments

En la Tecnología "Sistemas electrónicos", la asignatura "Electrónica analógica" de 3er curso, continúa una parte del temario (amplificadores operacionales).

IDENTIFYING DATA				
(*)Electrónica dixital				
Subject	(*)Electrónica dixital			
Code	V05G300V01402			
Study programme	(*)Grao en Enxeñaría de Tecnoloxías de Telecomunicación			
Descriptors	Credit.	Type	Year	Quadmester
	6	Mandatory	2nd	2nd
Language	(*)Castelán			
Department				
Coordinador	Mandado Perez, Enrique Pérez López, Serafín Alfonso			
Lecturers	Alvarez Ruiz de Ojeda, Luis Jacobo Dominguez Gomez, Miguel Angel Machado Dominguez, Fernando Mandado Perez, Enrique Pérez López, Serafín Alfonso			
E-mail	nurus@hotmail.com emandado@uvigo.es			
Web	http://fatic.uvigo.es			
General description	(*)This *asignatura, has like main objective that the students learn so much the basic theoretical concepts like the electronic circuits associated with the analysis and the design of the circuits and digital electronic systems. For this they study in the first place the basic elements that compose the different digital circuits and his graphic representation. To continuation analyse the circuits *combinacionales and sequential of general application, his diagrams and logical symbols and the methods of description and simulation based in the languages of description hardware (*HDL) that use the paradigm of hierarchy of up downwards (top-*down), that is to say, from the description in high level to the synthesis and back physical realisation of the system.			

Competencies	
Code	
A23	The ability to analyze and design combinatory and sequential, synchronous and asynchronous circuits and the usage of integrated circuits and microprocessors.
A24	The knowledge and application of the fundamentals of description languages for hardware devices.
B4	The ability to use software tools that support problem solving in engineering
B5	The ability to use software tools to search for information or bibliographical resources

Learning aims		
	Typology	Competences
(*)T9: Capacity of analysis and design of circuits *combinacionales and sequential, synchronous and asynchronous.	know	A23
(*)Understanding and command of the basic concepts of the logical doors	know	A23
(*)Understanding and command of the circuits *combinacionales and sequential	Know How	A23
(*)Knowledge of the methods of description and simulation based in the languages of description hardware (*HDL).	know	A24
(*)Capacity of utilisation of tools *informáticasde description and simulation of digital systems.	Know How	B4
(*)Capacity of research and interpretation of characteristic leaves of logical doors, functional blocks and circuits	Know How	B5

Contents	
Topic	
(*)Subject 1: Introduction to the Digital Electronics	(*)Definition of the Digital Electronics. Analog and digital signals. Systems of numbering and digital codes. Foundations of the detection and the correction of errors.

(*)Subject 2: basic logical Functions and logical doors	(*)Algebra of *Boole. Table for real of the basic logical functions. Logical doors and his logical symbols. Circuits of the logical doors and types of exits of the same.
(*)Subject 3: logical Functions and systems *combinacionales	(*)Numerical and algebraic expressions of a logical function. Simplification of the logical functions. Implementation of the logical functions with universal logical doors *NAND and *NOR.
(*)Subject 4: Systems *combinacionales *deaplicación general	(*)Functional blocks: *Decodificadores *noexcitadores and *excitadores (*Drivers). Multiplexers. *Demultiplexores. Comparators. Detectors/*Generadoresde parity. Circuits *combinacionales arithmetical. Systems *combinacionalesprogramables: memories, matrices *PLA *yPAL. Description by means of *símboloslógicos. Description in *VHDL and simulation.
(*)Subject 5: Foundations of the *sistemassecuenciales	(*)Definition and classification. *Biestablesasíncronos. *Metaestabilidad. *Circuitosdigitales Temporary. Synchronous sequential systems: *Biestables synchronous. Description in *VHDLy simulation.
(*)Subject 6: synchronous sequential Systems	(*)General theory. Counters. Registers *dedesplazamiento. Banks of registers. Synchronous sequential systems of control. Description by means of diagrams and in *VHDL and simulation.
(*)Subject 7: Units by heart	(*)Definition. Classification. Memories of active random access (*Read/*Write) and passive (*Read *Only). Memories of sequential access tail (*FIFO) and battery (*LIFO). Memories *asociativas (*CAM).
(*)PRACTICE 1. INTRODUCTION To THE TOOL *ISE OF *XILINX	(*)Introduction. Diagram of general flow of the tool *ISE. Description by means of schematic. Realisation of examples.
(*)PRACTICE 2. INTRODUCTION AL *VHDL *I.	(*)Introduction. Basic syntax of a file *VHDL. Logical description. Types of data and objects. Operators. Concurrent and sequential sentences. Realisation of examples. Synthesis of the files *VHDL.
(*)PRACTICE 3. INTRODUCTION AL *VHDL *II.	(*)Obtaining of symbols for schematic. *Instanciación Of components. Definition of stimuli for simulation ("*testbench"). Realisation of examples.
(*)PRACTICE 4. *VERIFICACIÓN OF THE DIGITAL SYSTEM BY MEANS OF FUNCTIONAL SIMULATION.	(*)Introduction. Functional simulation. Realisation of examples.
(*)PRACTICE 5. *COMPILACIÓN And IMPLEMENTATION OF THE DIGITAL SYSTEM. *VERIFICACIÓN OF THE DIGITAL SYSTEM BY MEANS OF TEMPORARY SIMULATION And PROOF IN THE PLATE OF DEVELOPMENT.	(*)Introduction. Architecture of the *PLDs of the family *CoolRunner 2 of *Xilinx. Technology and methods of configuration of the *PLDs of *Xilinx. *Compilación And implementation of the digital system. Temporary simulation of the digital system. Plate of development "*CoolRunner 2 *starter *kit" based in *PLDs of *Xilinx. Programming of the *PLD with *iMPACT. *Comprobación Of the digital system implemented. Solution of problems. Realisation of examples.
(*)PRACTICE 6. DIGITAL INSTRUMENTATION.	(*)Introduction. Logical analyser. Circuits *antirrebotes for *pulsadores and switches.
(*)PRACTICE 7. CIRCUITS *COMBINACIONALES *I.	(*)Introduction.Design and realisation of circuits *combinacionales by means of descriptions in *VHDL with tables for real, logical equations and behaviour.
(*)PRACTICE 8. CIRCUITS *COMBINACIONALES *II.	(*)Introduction. Design and realisation of a system *combinacional with functional blocks described in *VHDL.
(*)PRACTICE 9. ARITHMETICAL CIRCUITS *I.	(*)Introduction. Design and realisation of arithmetical circuits by means of descriptions in *VHDL with tables for real, logical equations and behaviour.
(*)PRACTICE 10. ARITHMETICAL CIRCUITS *II.	(*)Introduction. Design and realisation of an arithmetical system with arithmetical functional blocks described in *VHDL. *Montaje Of a *visualizador of 7 segments.
(*)PRACTICE 11. SEQUENTIAL CIRCUITS *I.	(*)Introduction. Design and realisation of basic sequential circuits (*biestables, registers) by means of descriptions in *VHDL with tables for real, logical equations and behaviour.
(*)PRACTICE 12. SEQUENTIAL CIRCUITS *II.	(*)Introduction. Design and realisation of basic sequential circuits (counters, registers of trip) by means of descriptions in *VHDL with tables for real, logical equations and behaviour.
(*)PRACTICE 13. SYNCHRONOUS SEQUENTIAL SYSTEMS OF CONTROL.	(*)Introduction. Design and realisation of synchronous sequential systems of control by means of descriptions in *VHDL. Other tools for the description of diagrams of state of Synchronous Sequential Systems. Program *StateCAD of *Xilinx. Realisation of examples.

Planning

Class hours	Hours outside the classroom	Hores totals
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(*)Actividades introductorias	3	3	6
(*)Sesión maxistral	13	13	26
(*) Prácticas de laboratorio	24	36	60
(*) Resolución de problemas e/ou ejercicios	8	12	20
(*)Pruebas prácticas, de ejecución de tarefas reais e/ou simuladas.	2	9	11
(*) Pruebas de tipo test	1	2	3
(*)Pruebas de resposta curta	1	2	3
(*)Resolución de problemas e/ou ejercicios	4	17	21

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

Methodologies

	Description
(*)Actividades introductorias	(*)It takes of contact and presentation of the *asignatura. Presentation of the practices of laboratory and of the instrumentation and the computer tools (Software) that go to use.
(*)Sesión maxistral	(*)Exhibition by part of the professor of the contents of the matter object of study and presentation of the bibliography that has to use the student. Back personal work of the student to learn the concepts entered in the classroom using for this the bibliography proposed. Identification of possible doubts that will resolve in *tutorías *personalizadas.
(*) Prácticas de laboratorio	(*)Activities of application of the theoretical knowledges purchased. It will learn to handle the typical instrumentation of a laboratory of digital electronics and will realise *montajes of basic electronic circuits described in the sessions *magistrales. Also they will purchase skills of handle of computer tools of simulation. Personal work of the student of preparation of the practices, for which will use the available documentation and will review the theoretical concepts related, and will obtain and will analyse the results. Identification of doubts that will resolve in *tutorías *personalizadas.
(*) Resolución de problemas e/ou ejercicios	(*)Complementary activity of the sessions *magistrales. In her formulate and resolve problems and exercises related with the *asignatura. Personal work of the student to resolve problems and exercises proposed in the classroom as well as other extracted of the bibliography. Identification of the doubts that will resolve in *tutorías *personalizadas.

Personalized attention

	Description
(*)Sesión maxistral	(*)Sessions *magistrales. The students will have occasion of *acudir to *tutorías *personalizadas 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 web of the *asignatura. In said *tutorías will resolve the doubts arisen to the students on the contents *impartidos in the sessions *magistrales and will orient them so that they can address his study.Resolution of problems and exercises. The students will have occasion of *acudir to *tutorías *personalizadas 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 web of the *asignatura. In said *tutorías will resolve the doubts arisen to the students in relation with the problems and exercises proposed and resolved in the classroom as well as of other problems and exercises that arise along the study of the *asignatura.Practices of laboratory. The students will have occasion of *acudir to *tutorías *personalizadas 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 web of the *asignatura. In said *tutorías will resolve the doubts arisen to the students in relation with the development of the practices of laboratory, the handle of the instrumentation, the *montaje of the electronic circuits and the computer tool of simulation.
(*) Resolución de problemas e/ou ejercicios	(*)Sessions *magistrales. The students will have occasion of *acudir to *tutorías *personalizadas 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 web of the *asignatura. In said *tutorías will resolve the doubts arisen to the students on the contents *impartidos in the sessions *magistrales and will orient them so that they can address his study.Resolution of problems and exercises. The students will have occasion of *acudir to *tutorías *personalizadas 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 web of the *asignatura. In said *tutorías will resolve the doubts arisen to the students in relation with the problems and exercises proposed and resolved in the classroom as well as of other problems and exercises that arise along the study of the *asignatura.Practices of laboratory. The students will have occasion of *acudir to *tutorías *personalizadas 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 web of the *asignatura. In said *tutorías will resolve the doubts arisen to the students in relation with the development of the practices of laboratory, the handle of the instrumentation, the *montaje of the electronic circuits and the computer tool of simulation.

(*) Prácticas de laboratorio (*)Sessions *magistrales. The students will have occasion of *acudir to *tutorías *personalizadas 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 web of the *asignatura. In said *tutorías will resolve the doubts arisen to the students on the contents *impartidos in the sessions *magistrales and will orient them so that they can address his study. Resolution of problems and exercises. The students will have occasion of *acudir to *tutorías *personalizadas 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 web of the *asignatura. In said *tutorías will resolve the doubts arisen to the students in relation with the problems and exercises proposed and resolved in the classroom as well as of other problems and exercises that arise along the study of the *asignatura. Practices of laboratory. The students will have occasion of *acudir to *tutorías *personalizadas 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 web of the *asignatura. In said *tutorías will resolve the doubts arisen to the students in relation with the development of the practices of laboratory, the handle of the instrumentation, the *montaje of the electronic circuits and the computer tool of simulation.

Assessment		
	Description	Qualification
(*) Prácticas de laboratorio	(*)Practices that will realise in the laboratory along the course on the handle of the instrumentation, *montaje of digital electronic circuits and simulation. They will evaluate the competitions purchased by the student on the contents of the practices of laboratory of the *asignatura.	40
(*) Probas de tipo test	(*)Proofs that will realise in the classroom after each exposed subject in the sessions *magistrales to evaluate the knowledges purchased by the student.	10
(*)Probas de resposta curta	(*)Proofs that will realise in the classroom after each exposed subject in the sessions *magistrales to evaluate the knowledges purchased by the student.	10
(*)Resolución de problemas e/ou exercicios	(*)Proofs that will realise in the classroom along the course. They Will evaluate the competitions of the student to resolve problems and exercises on a part of the contents of the *asignatura.	40

Other comments and second call

(*)

1. Continuous evaluation

Following the own guidelines of the *titulación and the agreements of the academic commission will offer to the students that *cursen this *asignatura a system of continuous evaluation.

The *asignatura divide in two parts: theory (60%) and practical (40%).

1.To. Theory

They will realise 4 proofs of type test and of short answer properly *programadas along the course. These proofs will value of 0 to 10 and the total note of these proofs will be (*NPTT: Note of Proofs of Type Test; *NPRC: Note of Proofs of Short Answer):

$$*NPTT = (*NPTT1 + *NPTT2 + *NPTT3 + *NPTT4) / 4$$

$$*NPRC = (*NPRC1 + *NPRC2 + *NPRC3 + *NPRC4) / 4$$

They will realise 2 proofs of resolution of problems and/or exercises properly *programadas along the course. These proofs will value of 0 to 10 and the final note will be the average of the two (*NPE: Note of Problems and/or Exercises):

$$*NPE = (*NPE1 + *NPE2) / 2$$

In accordance with the criteria of evaluation the final note of theory (*NT) will be:

$$*NT = (1/6 \cdot *NPTT + 1/6 \cdot *NPRC + 4/6 \cdot *NPE)$$

Stop can opt by the continuous evaluation the student will have to realise the proofs described previously allowing that was missing at most to 2 proofs of short answers and type test (the note of the proofs to which was missing will be of 0).

The proofs are not recoverable, that is to say, that if a student can not assist the day in that they are *programadas the professor does not have obligation to repeat them.

If the final note of theory is lower than 4 on 10 or if it has been missing to more than 2 proofs of short answer and type test, will be compulsory to realise a final examination of theory, in the official date established by the School.

1.*b. Practical

They will realise 13 practices of laboratory in sessions of 2 hours and groups of 2 students that will describe by means of continuous evaluation. Each practice will have several separated and will value of 0 to 10, so that the realisation of all the separated will suppose the achievement of the maximum note. The final note of practical (*NP) will be the average of the notes of the practices:

$$*NP = *SUMATORIO(*NPi) / \text{Number_of_practices}$$

Stop can opt to the continuous evaluation of the practices the student will not be able to be missing to more than 2 practical sessions (the note of the practices to which was missing will be of 0).

If the final note of the practices is lower than 4 on 10 or if it has been missing to more than 2 practices will be compulsory to realise a final examination of practices, in the official dates that have the School.

1.*c. Final note of the *asignatura

In the final note (*NF) the note of theory (*NT) will have a weight of the 60 % and the note of practical (*NP) of 40%.

To approve the *asignatura will be indispensable to have obtained a minimum of 4 points on 10 so much in the part of theory (*NT) and in the practical (*NP).

In the case to surpass the two parts (*NT >= 4 and *NP >= 4) the final qualification will be the sum *ponderada of the notes of each part:

$$*NF = 0,6 \cdot *NT + 0,4 \cdot *NP \quad (= 0,1 \cdot *NPTT + 0,1 \cdot *NPRC + 0,4 \cdot *NPE + 0,4 \cdot *NP)$$

In the case of have not surpassed any of the two parts (*NT < 4 or *NP < 4), the final note will be the minimum of the sum *ponderada and 4,5:

$$*NF = \min\{0,6 \cdot *NT + 0,4 \cdot *NP; 4,5\}$$

2. Final examination

The students that do not opt by the continuous evaluation will be able to present to a final examination that will feature of a theoretical part and another practice that will celebrate in the dates that establish the *jefatura of studies of the School.

The theoretical examination will consist in a series of questions short answer and/or type test resolution of problems and/or exercises. This proof will value of 0 to 10 and the final note of theory (*NT) will be the qualification obtained.

The practical examination will consist in the resolution of a practical exercise in the laboratory. The practical proof will value of 0 to 10 to obtain the final note of practical (*NP).

The students than opting by the continuous evaluation have suspended (*NF < 5), or have not surpassed any of the parts (*NT < 4 or *NP < 4), also will be able to present to the final examination, being able to realise only the theoretical part, only the practical part, or realise both. To these students will conserve them the note of the part that have surpassed by means of continuous evaluation.

In any case, the calculation of the final note of the *asignatura will realise as you explain in the separated 1.*c.

3. On the second announcement

The second announcement will feature of a theoretical part and another practice with the same format that the final examination. To the students that present to this announcement will conserve them the note that have taken out in the ordinary announcement (continuous evaluation or final examination), by what will be able to realise only the theoretical part, only the practical part, or to the two. The final note of each part will be the best of the obtained by the student in the ordinary announcement and the one of recovery. The calculation of the final note of the *asignatura will realise as you explain in the separated 1.*c.

4. Validity of the qualifications

The qualification of the *asignatura will be valid only for the academic course in which obtains .

Sources of information

Wakerly J. F., Digital design. Principles & practices, 3ª, Prentice Hall. 2001

Thomas L. Floyd, Fundamentos de Sistemas Digitales, 9ª, Prentice Hall. 2006

E. Mandado, Sistemas Electrónicos Digitales, 9ª, Marcombo. 2008

Recommendations

Subjects that are recommended to be taken simultaneously

(*)Tecnología electrónica/V05G300V01401

Subjects that it is recommended to have taken before

(*)Física: Fundamentos de electrónica/V05G300V01305

IDENTIFYING DATA				
(*)Redes de ordenadores				
Subject	(*)Redes de ordenadores			
Code	V05G300V01403			
Study programme	(*)Grao en Enxeñaría de Tecnoloxías de Telecomunicación			
Descriptors	Credit.	Type	Year	Quadmester
	6	Mandatory	2nd	2nd
Language	(*)Castelán			
Department				
Coordinador	Fernandez Veiga, Manuel			
Lecturers	Fernandez Veiga, Manuel Herreria Alonso, Sergio Lopez Ardao, Jose Carlos Rodriguez Perez, Miguel Sousa Vieira, Estrella			
E-mail	mveiga@det.uvigo.es			
Web	http://tic-tac.teleco.uvigo.es/group/ro			
General description	Operating principles, architecture, technology and norms of computer networks, especially of Internet. Design-oriented course, complemented by practical skills			

Competencies	
Code	
A1	The ability to write, develop and sign projects in the field of Telecommunication Engineering, according to the knowledge acquired as considered in section 5 of this Law, the conception and development or operation of networks, services and applications of Telecommunication and Electronics.
A3	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
A4	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.
A8	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.
A9	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
A20	The ability to conceive, deploy, organize and manage networks, systems, services and Telecommunication infrastructures in residential (home, city, digital communities), business and institutional environments, being responsible for launching of projects and continuous improvement like knowing their social and economical impact.
A26	The knowledge and usage of concepts of communication network architecture, protocols and interfaces
A27	The ability to differentiate the concepts of access and transport networks, packet and circuit switched networks, mobile and fixed networks, as well as distributed newtwork application and systems, voice, data, video, audio, interactive and multimedia services
A28	The knowledge of methods of networking and routing, as well as the fundamentals of planning and network evaluation based on traffic parameters

Learning aims		
	Typology	Competences
CG1 Capacidade para redactar, desenvolver e asinar proxectos no ámbito da enxeñaría de telecomunicación que teñan por obxecto, de acordo cos coñecementos adquiridos segundo o establecido no epígrafe 5 desta orde, a concepción e o desenvolvemento ou a explotación de redes, servizos e aplicacións de telecomunicación e electrónica.	know Know How	A1
CG3 Coñecemento de materias básicas e tecnoloxías que capaciten o alumno para a aprendizaxe de novos métodos e tecnoloxías, así como para dotalo dunha gran versatilidade para adaptarse a novas situacións.	know	A3

CG4 Capacidade para resolver problemas con iniciativa, para a toma de decisións, a creatividade, e para comunicar e transmitir coñecementos, habilidades e destrezas, comprendendo a responsabilidade ética e profesional da actividade do Enxeñeiro Técnico de Telecomunicación.	know Know How	A4
CG8 Coñecer e aplicar elementos básicos de economía e de xestión de recursos humanos, organización e planificación de proxectos, así como de lexislación, regulación e normalización nas telecomunicacións.	know	A8
CG9 Capacidade para traballar nun grupo multidisciplinar e nunha contorna multilingüe e de comunicar, tanto por escrito como de forma oral, coñecementos, procedementos, resultados e ideas relacionadas coas telecomunicacións e a electrónica.	Know How	A9
CE11/T6 Capacidade para concibir, despregar, organizar e xestionar redes, sistemas, servizos e infraestruturas de telecomunicación en contextos residenciais (fogar, cidade e comunidades dixitais), empresariais ou institucionais responsabilizándose da súa posta en marcha e mellora continua, así como para coñecer o seu impacto económico e social.	know Know How	A20
CE17/T12 Coñecemento e utilización dos conceptos de arquitectura de rede, protocolos e interfaces de comunicacións.	know Know How	A26
CE18/T13 Capacidade de diferenciar os conceptos de redes de acceso e transporte, redes de conmutación de circuítos e de paquetes, redes fixas e móbiles, así como os sistemas e aplicacións de rede distribuídos, servizos de voz, datos, audio, vídeo e servizos interactivos e multimedia.	know	A27
CE19/T14 Coñecemento dos métodos de interconexión de redes e encamiñamento, así como os fundamentos da planificación e dimensionado de redes en función de parámetros de tráfico.	know Know How	A28

Contents

Topic		
1. Introduction. General concepts	a) Nodes, links and networks b) Access networks c) Core network: circuit & packet switching	
2. Internet	a) Architecture. Service model b) Layering	
3. IP	a) Anatomy b) Addressing & fragmentation	
4. IP switching & forwarding	a) IP forwarding b) Switching fabrics	
5. Name and address translation	a) ARP, DNS & NAT b) Transition IPv4/IPv6 c) Tunnels and overlay networks	
6. Routing	a) Network graphs. Optimization principle b) Spanning tree c) Bellman-Ford formulation	
7. Routing algorithms	a) Link state b) Distance vector protocols c) RIP, OSPF	
8. Path vector routing	a) Autonomous systems b) Prefix announcement & aggregation c) BGP, eBGP, iBGP c) Routing policy	
9. Transport	a) Service model b) TCP & UDP c) Transport connections: establishment, retransmissions, flow control	
10. Congestion control	a) Network model b) Dynamics, fairness and stability c) TCP Reno, Vegas, FAST	
11. Web. Content distribution networks	a) HTTP protocol b) Proxy web. Caching. Persistence c) Content distribution networks: architecture and operations	
12. P2P networking and applications	a) Indexing, searching and retrieving information b) Swarming. Incentives c) Distributed data structures	

13. Security I	a) Vulnerabilities. Protection c) Secure network and transport layers c) Denial of service. Spoofing d) Basics of cryptography
14. Security II	a) IPSEC. TLS/SSL, virtual private networks. b) Public key infrastructure. Secure applications

Planning			
	Class hours	Hours outside the classroom	Hores totals
(*) Sesión maxistral	28	56	84
(*) Resolución de problemas e/ou ejercicios	20	20	40
(*) Obradoiros	6	6	12
(*) Resolución de problemas e/ou ejercicios de forma autónoma		12	12
(*) Resolución de problemas e/ou ejercicios	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
(*) Sesión maxistral	Exposition of ideas, concepts, techniques and algorithms that shape every lecture.
(*) Resolución de problemas e/ou ejercicios	Resolution by the students of problems and exercises about the material covered in the lectutres. Work supervised by the teaching staff.
(*) Obradoiros	Hands-on learning of basic software tools for diagnosing, monitoring and operating computer networks at any level. Development of a basic network application.
(*) Resolución de problemas e/ou ejercicios de forma autónoma	Independent homework by the students. Written resolution of problems and exercises, in due date. Three graded homeworks along the term.

Personalized attention	
	Description
(*) Sesión maxistral	Individual tuition will be dispensed to the students in the office hours announced at the beginning of the term. It is not mandatory to book the appointment.

Assessment		
	Description	Qualification
(*) Resolución de problemas e/ou ejercicios de forma autónoma	Independent work by the student. Solving of problems and exercises assigned by the teaching staff. These homeworks are a written and graded assignment.	30
(*) Resolución de problemas e/ou ejercicios	Written examination covering the whole course material. Questions, problems and exercises, possibly analytical or numerical. Duration: two hours.	70

Other comments and second call

The students will choose their grading method between two possibilities: continuous assessment or single examination.

The continuous assessment comprises the resolution of three groups of homework problems (10% of the final grade each) plus the realization of a written examination at the end of the term (70% of the final grade). The homeworks will be delivered in weeks 5, 10 and 14. In order to receive grading, the students must submit them within 7 days since publication; in at most five days, the teaching staff will review, evaluate and give back the homework to its author. Homework gradings will only be valid during the academic year.

The single examination option will require the student to pass a written exam about the contents of the subject. The final grade will be equal to the points awarded to this exam.

Every student who submits the three proposed homeworks or attends to the final exam will be graded. The grading option

(continuous assessment or single examination) ought to be indicated in the exam cover. Whatever the choice, the exam will be identical for both options.

Those who fail the subject in the first call at the end of the ordinary term can use the second call in July, which consist in taking a single written exam. The students will be graded according to the option (continuos or single) of their preference, as marked in the exam cover.

Sources of information

J.F. Kurose, K.W. Ross, Computer networking: a top-down approach featuring the Internet, 5, 2010

L. Peterson, B. Davie, Computer networks: a systems approach, 5, 2011

C. López, M. Rodríguez, S. Herrería, M. Fernández, Cuestiones de redes de datos: principios y protocolos, 1, 2008

Recommendations

Subjects that are recommended to be taken simultaneously

(*)Comunicación de datos/V05G300V01301

Subjects that it is recommended to have taken before

(*)Matemáticas: Álgebra lineal/V05G300V01104

(*)Matemáticas: Probabilidad e estadística/V05G300V01204

Other comments

Though advisable, it is not necessary prior exposure to computer programming.

IDENTIFYING DATA**(*)Técnicas de transmisión e recepción de sinais**

Subject	(*)Técnicas de transmisión e recepción de sinais			
Code	V05G300V01404			
Study programme	(*)Grao en Enxeñaría de Tecnoloxías de Telecomunicación			
Descriptors	Credit.	Type	Year	Quadmester
	6	Mandatory	2nd	2nd
Language	(*)Castelán			
Department				
Coordinador	Gonzalez Prelcic, Nuria Lopez Valcarce, Roberto			
Lecturers	Comesaña Alfaro, Pedro Fernández Barciela, Mónica Gonzalez Prelcic, Nuria Isasi de Vicente, Fernando Guillermo Lopez Valcarce, Roberto Marquez Florez, Oscar Willian Rodriguez Banga, Eduardo			
E-mail	nuria@gts.tsc.uvigo.es valcarce@gts.uvigo.es			
Web	http://faitic.uvigo.es/			
General description	The course "Techniques for Signal Transmission and Reception" is an introduction to the different existent methods for the exchange of information in digital format at the physical layer level. Its main focus is on pulse amplitude modulation (PAM) as illustrative example. The main components of a digital transmitter and receiver are described, as well as the different effects caused by the communication channel and the different performance parameters of a digital system.			

Competencies

Code	
A3	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
A4	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.
A6	The aptitude to manage mandatory specifications, procedures and laws.
A16	The ability to use communication and software applications (ofimatics, databases, advanced calculus, project management, visualization, etc.) to support the development and operation of Electronics and Telecommunication networks, services and applications
A18	The ability to analyze and specify the main parameters of a communications system.
A19	The ability to evaluate the advantages and disadvantages of different technological alternatives in the implementation and deployment of communication systems from the point of view of signals, perturbations, noise and digital and analogical modulation systems
A29	The knowledge of national, European and international telecommunication regulations and laws.

Learning aims

	Typology	Competences
Ability to use communication and office computer applications (databases, advanced computation, project management, visualisation tools, etc.) to support the development and exploitation of networks, services, and telecommunication and electronics applications.	know Know How	A16
Ability to analyse and specify the fundamental parameters of a communications system.	know	A18

Ability to evaluate the advantages and drawbacks of different technological alternatives for the deployment or implementation of analog and digital communication systems, from the signal space point of view, and taking into account the perturbations and the noise.	know	A19
Knowledge of basic technologies that enable the student to learn new methods and techniques, with the flexibility required to adapt to new situations.	know	A3
Ability to solve problems with initiative, decision making, and creativity.	know Know be	A4
Familiarity with the use of technical documents, data sheets and standards.	Know be	A6
Familiarity with telecommunication regulations and standards at the national, European and world levels.	know	A29

Contents

Topic	
1. Introduction to digital communication systems	-Basic elements and general description of a communication system. -Analog and digital communications -Description of a digital transmitter -Description of a digital receiver
2. Signals, systems and stochastic processes in communications	-Review of basic concepts: signals, systems, transforms. -Autocorrelation function of a stochastic process. -Power spectral density. Transmitted power, transmission bandwidth. -Noise characterization
3. Frequency conversion and analog processing	-Amplitude modulation (AM): with large carrier, with suppressed carrier -I/Q Modulation and demodulation. - Transceiver requirements and specifications -Receiver architectures: direct conversion, intermediate frequency. Analog and digital stages.
4. Modulation and detection in Gaussian channels	-Introduction to the Signal Space -Derivation of the Matched Filter -Maximum A Posteriori (MAP) and Maximum Likelihood (ML) detectors -Probability of error
5. Pulse amplitude modulation (PAM)	- Baseband PAM - Bandlimited channels and intersymbol interferences (ISI) - Nyquist criterion, raised cosine pulses, eye diagram - Bandpass PAM
6. The communication channel	-Transmission media -Signal to noise ratio -Multipath and frequency selectivity -Fading -Doppler effect

Planning

	Class hours	Hours outside the classroom	Hores totals
(*)Sesión maxistral	27	27	54
(*)Prácticas en aulas de informática	17	17	34
(*) Resolución de problemas e/ou ejercicios	0	25	25
(*) Prácticas de laboratorio	10	10	20
(*)Probas de resposta longa, de desenvolvemento	1	9	10
(*)Probas de resposta curta	1	6	7

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

Methodologies

	Description
(*)Sesión maxistral	Presentation and discussion of the fundamental theory
(*)Prácticas en aulas de informática	The concepts presented in class will be further illustrated and developed by means of Matlab-based simulation and signal processing tools
(*) Resolución de problemas e/ou ejercicios	Students will be given different take-home sets of problems. The answers to selected problems will be provided later on.

(*) Prácticas de laboratorio	Experimental study of the different components and effects in analog transmitter/receiver frontends
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Personalized attention

	Description
(*) Sesión maxistral	Student aid will be provided during office hours as well as on-line (email, chat). On-line discussion forums will be set up for each chapter, through the usual e-learning platform.
(*) Prácticas en aulas de informática	Student aid will be provided during office hours as well as on-line (email, chat). On-line discussion forums will be set up for each chapter, through the usual e-learning platform.
(*) Prácticas de laboratorio	Student aid will be provided during office hours as well as on-line (email, chat). On-line discussion forums will be set up for each chapter, through the usual e-learning platform.
(*) Resolución de problemas e/ou ejercicios	Student aid will be provided during office hours as well as on-line (email, chat). On-line discussion forums will be set up for each chapter, through the usual e-learning platform.

Assessment

	Description	Qualification
(*) Probas de resposta curta	After each lab session a short test will be given	40
(*) Probas de resposta longa, de desenvolvemento	Final examination	60

Other comments and second call

For those students that opt for continuous evaluation:

- Final Exam: 60%
- Several short tests: 40%

(one short test at the end of each lab session, approximately in weeks 4, 8, 10 and 14. Results will be announced within a reasonable time. If a student does not show up, the instructors have no obligation to reschedule the test for him/her).

For those students that do not opt for continuous evaluation:

- Final Exam: 100%

The student may opt out of the continuous evaluation after the second short test, communicating his/her choice to the instructors within a deadline. Students that choose the continuous evaluation format at that point and do not pass the course will be assigned the grade "fail" regardless of any potential no-shows.

The short tests grades will be kept for the second call, if the case, but they will not be kept for future years. In the second call, students will be allowed to opt out of the continuous evaluation format.

Sources of information

Bernard Sklar, Digital Communications: Fundamentals and Applications, 2, 2001
A. Artés, F. Pérez González et al., Comunicaciones Digitales, 1, 2007
C.R. Johnson Jr., W.A. Sethares, Telecommunication Breakdown, 1, 2004
Leon W. Couch, Digital & Analog Communication Systems, 7, 2006

Recommendations

Subjects that it is recommended to have taken before

- (*) Física: Análise de circuitos lineais/V05G300V01201
- (*) Matemáticas: Probabilidade e estadística/V05G300V01204
- (*) Procesado dixital de sinais/V05G300V01304

Other comments

It is assumed that the student has basic knowledge of analog and digital signal processing, as well as of probability and

IDENTIFYING DATA				
(*)Fundamentos de son e imaxe				
Subject	(*)Fundamentos de son e imaxe			
Code	V05G300V01405			
Study programme	(*)Grao en Enxeñaría de Tecnoloxías de Telecomunicación			
Descriptors	Credit.	Type	Year	Quadmester
	6	Mandatory	2nd	2nd
Language	(*)Castelán			
Department				
Coordinador	Pena Gimenez, Antonio			
Lecturers	Abreu Sernandez, Maria Victoria Martin Herrero, Julio Martin Rodriguez, Fernando Pena Gimenez, Antonio Sobreira Seoane, Manuel Angel			
E-mail	apena@gts.tsc.uvigo.es			
Web	http://faitic.uvigo.es			
General description	(*)“Foundations of sound and image” presents the basic concepts of the nature of the sound and the image, as well as the processes that realise with the audiovisual signals, essential reason of the existence of the concept “telecommunication”.			

Competencies	
Code	
A3	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
A5	The knowledge to perform measurements, calculations, assessments, appraisals, technical evaluations, studies, reports, task scheduling and similar work to each specific telecommunication area.
A22	The ability to understand the electromagnetic and acoustic wave mechanisms of propagation and transmission, and their corresponding receiving and transmitting devices

Learning aims		
	Typology	Competences
(*)*T8: Capacity to comprise the mechanisms of propagation and transmission of electromagnetic and acoustic waves, and his corresponding devices *emisores and receptors.General competitions	know Know How	A22
(*)	Know How	A3
(*)	Know How	A5

Contents	
Topic	
(*)Analysis of sound	(*)Variability of the sound. Temporary analysis. *Slow, *fast, *impulse, *peak.Analysis in frequency. Filters based in eighth. *DFT. *Enventanado. Resolution time-frequency. Spectrograms.
(*)Basic acoustics (1/2)	(*)The sound. Wavelength, frequency, period, speed of propagation. Energy, pressure, intensity, power. Acoustic impedance.Diffraction. Reflection. Refraction.Propagation. Speed of the sound. *Doppler. Transmission between distinct means.
(*)Perception	(*)Physiology. Audible feelings. Critical band. Space audition.Psychology of the perception. Bell. Evaluation of the quality.Losses *auditivas and annoyances.
(*)Levels	(*)Decibel. Units. Operations with decibels. Dynamic rank.*Ponderaciones *perceptuales. Time of exhibition. Equivalent levels. Levels of beak. Levels of evaluation.

(*)Basic acoustics (2/2)	(*)Adaptation of impedances. Mitigation in propagation. Absorption.Radiation. Near and far field. Parameters of radiation. Impedance of radiation. Infinite plane. Tubes and cavities.
(*)Production	(*) Production of the human voice. Musical instruments: notions. Sources and transmissive of noise: machines, pipes, buildings.
(*)Review of processes and systems	(*)Microphones. Speakers and acoustic boxes. *Crossovers. Systems of audio.Architectural acoustics. Processed of sound. Audiovisual technology.Finite elements. Maps of noise. *Silenciadores. Control of noise. *Edificación. Environmental legislation and *edificación. Technicians of measure. Uncertainty. Management of quality.
(*)Colorimetry	(*)Human visual system, the image and the colour like signals, colorimetry *R,G,*B.Lens. Election of lens, procedure of *calibración.
(*)Capture and representation of Image	(*)Foundations of cameras. Foundations of representation.
(*)Coding of image and video	(*)Coding of fixed Image, formats.Coding of Video, formats.

Planning

	Class hours	Hours outside the classroom	Hores totals
(*)Sesión maxistral	28	56	84
(*) Resolución de problemas e/ou exercicios	6	12	18
(*)Prácticas en aulas de informática	17	12.75	29.75
(*)Probos de autoavaliación	0	10	10
(*)Probos de resposta curta	5	0	5
(*)Informes/memorias de prácticas	0	3.25	3.25

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

Methodologies

	Description
(*)Sesión maxistral	(*)Exhibition by part of the professor of the contents of the matter, *fomentando the critical discussion of the concepts. Feel the theoretical bases of algorithms and procedures used to resolve problems.
(*) Resolución de problemas e/ou exercicios	(*)Posed a determinate situation, the student has to obtain the suitable solution of a form reasoned, choosing properly the applicable formulas and arriving to a valid solution.
(*)Prácticas en aulas de informática	(*)I handle and adjust of tools of analysis and algorithms, identifying which use in each situation posed.

Personalized attention

	Description
(*)Sesión maxistral	(*)Will be able to solve doubts in the *tutorías of the *profesorado. These *tutorías will realise :* Individually or in groups reduced (typically with a maximum of 2-3 students).* I save that it indicate the contrary, previous appointment with the corresponding professor. The appointment will request and will agree by electronic post, preferably in the time and place reserved officially.
(*) Resolución de problemas e/ou exercicios	(*)Will be able to solve doubts in the *tutorías of the *profesorado. These *tutorías will realise :* Individually or in groups reduced (typically with a maximum of 2-3 students).* I save that it indicate the contrary, previous appointment with the corresponding professor. The appointment will request and will agree by electronic post, preferably in the time and place reserved officially.
(*)Prácticas en aulas de informática	(*)Will be able to solve doubts in the *tutorías of the *profesorado. These *tutorías will realise :* Individually or in groups reduced (typically with a maximum of 2-3 students).* I save that it indicate the contrary, previous appointment with the corresponding professor. The appointment will request and will agree by electronic post, preferably in the time and place reserved officially.
(*)Informes/memorias de prácticas	(*)Will be able to solve doubts in the *tutorías of the *profesorado. These *tutorías will realise :* Individually or in groups reduced (typically with a maximum of 2-3 students).* I save that it indicate the contrary, previous appointment with the corresponding professor. The appointment will request and will agree by electronic post, preferably in the time and place reserved officially.

Assessment		
	Description	Qualification
(*) Resolución de problemas e/ou exercicios	(*)Collected at the end of the turn of group *B of a problem posed to half of the same.	4.5
(*)Prácticas en aulas de informática	(*)Collected at the end of the turn of computer classroom of some results obtained along the same.	4.5
(*)Informes/memorias de prácticas	(*)Assessment of the work written that describes the work of several weeks in the computer classroom.	15
(*)Probas de autoavaliación	(*)Participation in forums of debate and resolution of tests of *autoevaluación.	11
(*)Probas de resposta curta	(*)Examination written of evaluation, with brief questions and problems.	65

Other comments and second call

(*)

Following the proper guidelines of the *titulación offer *ós students that *cursen this subject two systems of evaluation: continuous evaluation *y evaluation no *contínua (*ó end of the *cuadrimestre).

EVALUATION *CONTÍNUA

The evaluation *contínua features of the proofs that detail the continuation in this *guia and are not recoverable, is to say, if the student can not realize them in the date stipulated the *profesorado does not have the duties to repeat them. The tasks *avaliáveis will be valid so alone stop the academic course in the that realize .It understands that the student opts by the evaluation *contínua realizes the "proof 1 of short answer" (see the continuation). Once realized this proof understands that the student tighten presented to the announcement and *asignaraselle the *calificación that result of the application of the criterion that details the continuation, with independence @de que present or no *ó final @exame.

Type and assessment of activities:

1. * Resolution of problems and/or exercises (Weight: #4.5%): roughly in the weeks 5, 7 and 11.
2. * Practices in the classrooms of *informática (Weight: #4.5%): roughly in the weeks 3, 4 and 6.
3. * Reports/memories of practical (Weight: #15%): *desarrollanse roughly in the weeks 12, 13 and 14.
4. * *Pruebas Of *autoavaliación, participation in forums of debate and resolution of tests of *autoavaliación (Weight: #11%): *desarrollanse along the course in the platform *fatic.
5. * *Prueba 1 of short answer (Weight: #15%): roughly in the week 8. *Inclue Several subjects treated in the *asignatura.
6. * *Prueba 2 of short answer (Weight: #50%): it coincides with the date of the final @exame of the *asignatura. *Inclue All the no evaluated subjects in the Proof 1 of short answer.

The final note obtained corresponded to the sum of the punctuation obtained in all the activities realized. To approve, the student owes to obtain, *alomenos, five points in the *devandita final note.

EVALUATION NO *CONTÍNUA

If the student does not realize the "proof 1 of short answer", mentioned previously, understood that it will be evaluated with one only final @exame in the official date assigned pole Centre. This final @exame will be *calificado between 0 and 10 points and will include how possible contents all the *asignatura. To approve, the student owes to obtain, *alomenos, five points. The student can take part, if it wishes it, in the activities of evaluation *contínua, except in the Proof 2 of short answer, but will not be him valued.

Extraordinary announcement:

⇒ The student that have been evaluated by Evaluation *Contínua can opt between two possibilities the same day of the @exame:

1. Realize of new the Proof 2 of short answer in the official date assigned pole Centre and be evaluated second the stipulated stop the system of "evaluation *contínua". *Inclue All the no evaluated subjects in the Proof 1 of short answer. The final note obtained corresponded to the sum of the punctuation obtained in all the activities realized. To approve, the student owes to obtain, *alomenos, five points in the *devandita final note.
2. Be evaluated with one only final @exame in the official date assigned pole Centre. This final @exame will be *calificado between 0 and 10 points and will include how possible contents all the *asignatura. To approve, the student owes to obtain, *alomenos, five points. It does not value any another activity realized.

⇒ The student that do not have been evaluated by Evaluation *Contínua:

* It will be evaluated with one only final @exame in the official date assigned pole Centre. This final @exame will be *calificado between 0 and 10 points and will include how possible contents all the *assinatura. To approve, the student owes to obtain, *alomenos, five points. It does not value any another activity realized.

Sources of information

Lawrence Kinsler, Austin Frey, Alán Coppins, James Sanders, FUNDAMENTALS OF ACOUSTICS, , John Wiley & sons, Inc

R. J. Clarke, Digital Compression of Still Images and Video, , Academic Press.

T. Perales Benito, Radio y Televisión Digitales: Tecnología de los Sistemas DAB, DVB, IBUC y ATSC, , Creaciones Copyright

Ulrich Reimers, DVB : the family of international standards for digital video broadcasting, , Springer

(*)In addition to the bibliography mentioned the student will have how material of support:

* Scripts of theory: material that contains the theoretical base of the that will treat with more detail in the sessions *presenciais.

* Scripts of the practical: billed and problems of each practical session.

* Copy of the material graphic used in the sessions *presenciais.

* Questions and problems proposed.

Recommendations

Subjects that are recommended to be taken simultaneously

(*)Técnicas de transmisión e recepción de sinais/V05G300V01404

Subjects that it is recommended to have taken before

(*)Física: Campos e ondas/V05G300V01202

(*)Física: Fundamentos de mecânica e termodinâmica/V05G300V01102

(*)Procesado dixital de sinais/V05G300V01304

(*)Transmisión electromagnética/V05G300V01303