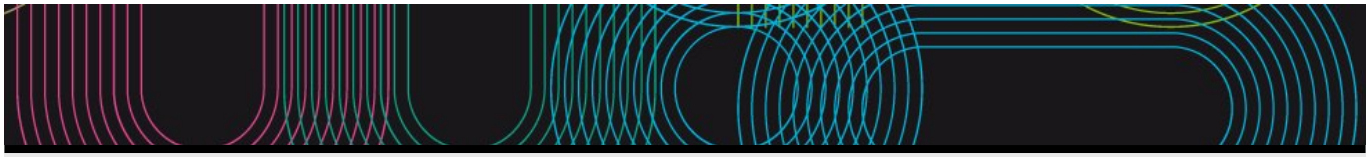

IDENTIFYING DATA

Physics: Analysis of Linear Circuits

Subject	Physics: Analysis of Linear Circuits			
Code	V05G300V01201			
Study programme	Degree in Telecommunications Technologies Engineering			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Basic education	1st	2nd
Teaching language	Spanish			
Department				
Coordinator	García-Tuñón Blanca, Inés			
Lecturers	Cardenal López, Antonio José García Mateo, Carmen García-Tuñón Blanca, Inés Gómez Araújo, Marta Prol Rodríguez, Miguel			
E-mail	inesgt@com.uvigo.es			
Web	http://www.faitic.uvigo.es			
General description	The course introduces the fundamentals of the lumped circuit principles and abstractions on which the design of electronic systems is based. These include lumped circuit models for sources, resistors, inductors, and capacitors. It intends to present some techniques to analyze (to determine currents and voltages) such systems: conventional analysis (integer-differential analysis, phasors and impedances in sinusoidal regime) and linear systems theory based analysis (by using the Laplace and Fourier transforms).			

Competencies

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

Learning outcomes

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

Contents

Topic	
Presentation and introduction.	
I: Continuous Response (RPC)	Fundamental and derived magnitudes. Active and passive elements and their functional relationships. Kirchhoff's laws. Analysis by the technique of mesh voltages. Analysis by the techniques of node currents. Simplifying techniques; Thévenin and Norton equivalent circuits.
II: Steady-state sinusoidal response (RSP)	Definition and parameters. Concepts of phasor and impedance. Mesh and node analysis of steady-state sinusoidal regime networks. Divisor circuits. Autoinductance and mutual inductance. Linear and ideal transformers. Power expressions. Thévenin and Norton equivalent circuits.
III: Two-ports	Definition of a two-port circuit. Characteristic parameters. Combining two-ports. A two-port in a circuit.
IV: Transient Response (RT)	Transient regime origin. Conditions of study. Inductors and capacitors in steady-state continuous regime. Single reactive element networks. Two reactive elements networks.
V: Signals and systems	lasses of signals. Some relevant signals: step function, unit impulse function, exponential function, sinusoidal function. Classes of systems. System properties; linear, time invariant systems; response to impulse.
VI: Laplace transform (TL)	Definition. Direct transforms. Inverse transform determination. Application to linear circuits. The transference function. Steady-state response in a circuit. Response for a sinusoidal input.
VII: Frequency domain analysis (RF)	Filter concept. Filter classes. Filter responses. Periodic signals.

Planning			
	Class hours	Hours outside the classroom	Total hours
Introductory activities	0.5	0	0.5
Master Session	24.5	49	73.5
Practice in computer rooms	22	22	44
Laboratory practises	3	3	6
Troubleshooting and / or exercises	3	9	12
Practical tests, real task execution and / or simulated.	1	3	4
Long answer tests and development	2	8	10
*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.			

Methodologies	
	Description
Introductory activities	Presentation of the course: syllabus, bibliography, teaching methodology, and assessment and grading procedures. Through this methodology the competencies CT2 and CT3 are developed.

Master Session	The goal of this methodology is the presentation of the theoretical contents and the practical assessment about students learning abilities. Different exercises and problems related to the specific subject will be solved during these sessions, by the Professor or the students with his/her support, either individually or working in a group. Through this methodology the competencies CG3, CG4, CE4, CT2 and CT3 are developed.
Practice in computer rooms	Theses sessions will consist on a supervised either individual or team problem solving of practical applications related to the theoretical content of the subject. The solutions could be analyzed, checked and compared using computational tools. Al the end of 3 sesions, students will solve a evaluable task in a individual way. Through this methodology the competencies CG3, CG4 and CE4 are developed.
Laboratory practises	Two practical sessions will be carried out in the hardware lab, assembling and measuring circuits tasks will be covered. A total of 4 hours, with 1 hours dedicated to the evaluation of these sessions. Through this methodology the competencies CG3, CG4 and CE4 are developed.

Personalized attention

Methodologies	Description
Master Session	Needs and study matter queries of students will be addres by the professors on tutoring hours.
Laboratory practises	Professors set the pace of the session and resolve any questions that arise during the realization of practice. Also on the schedule tutoring, professors address the needs and queries of the students related to laboratory practices.
Practice in computer rooms	Professors set the pace of the session and resolve any questions that arise during the realization of practice. Also on the schedule tutoring, professors address the needs and queries of the students related to practices in computer rooms.

Assessment

	Description	Qualification	Training and Learning Results	
Troubleshooting and / or exercises	Three tests will take place in Group A timetable. They are expected to be carried out in week 6 (ECA1 Chapter 1), 10 (ECA2 Chapters 2 to 4) and 15 (ECA3 Chapters 5 to 7). The mark of each of these tests will be: 1.5, 3.0 and 2.5 points respectively. Three tests will take place in Group B timetable. They are expected to be carried out in week 4(ECB1), 8 (ECB2) and 15 (ECB3). The mark of each of these tests will be 0.5 ponits.	85	B3 B4	C4
Practical tests, real task execution and / or simulated.	There will be one test/task (ECHW) related to assembling and measuring circuits. The test will be carried out in Group B timetable. This test is expected to be carried out in week 12 with a maximum mark of 1.5 points. The following skills will be evaluated: teamwork, fit to design specifications and presenting results.	15	B3 B4	C4
Long answer tests and development	Additionally to the continuous evaluation system based on the results achieved on the aforementioned tests, the students will have the option of a final examination. This final exam can include test type and/or reasoning questions, problem solving and/or exercises, as well as the development of practical cases. The maximum mark achieved on this exam will be 10 points.	0	B3 B4	C4

Other comments on the Evaluation

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

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

Additional comments:

- Students must attend to the group B assigned at the beginning of the semester.
- Group B attendance control will be carried out.
- HW sessions attendance will be mandatory.
- Doing ECA2 or sucessives tests and/or the final exams will prevent the student to get the "Not presented" mark.
- The average grade obtained during continuous evaluation will only be valid only for the corresponding academic year.
- It will be considered that the subject has been passed if the final grade is equal or above 5.

Re-scheduling of tests. In case of missing a test, instructors have not any compulsion to rescheduling.

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

Sources of information

Basic Bibliography

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

Material docente, **Página web**, faitic.uvigo.es,

Complementary Bibliography

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

Recommendations

Subjects that continue the syllabus

Physics: Fundamentals of Electronics/V05G300V01305
Digital Signal Processing/V05G300V01304
Signal Transmission and Reception Techniques/V05G300V01404
Microwave Circuits/V05G300V01611
Radio Frequency Circuits/V05G300V01511
Analogue Electronics/V05G300V01624
Engineering of Electronic Equipment/V05G300V01523

Subjects that are recommended to be taken simultaneously

Mathematics: Calculus 2/V05G300V01203

Subjects that it is recommended to have taken before

Mathematics: Linear algebra/V05G300V01104
Mathematics: Calculus 1/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.