COURSE PROGRAM

Academic Year: 2024/2025

Identification and characteristics of the course				
Code	500786	ECTS Credits	6	
Course name (English)	Electronics			
Course name (Spanish)	Electrónica			
Degree programs	Bachelor Degree in Physics			
Faculty/School	Faculty of Science			
Semester	6th	Type of course	Obligatory	
Module	Obligatory			
Matter	Modern Physics			
Lecturer/s				
Name	Office	E-mail	Web page	
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Subject Area	Electronics			
Department	Electrical Engineering, Electronics and Automation			
Coordinating Lecturer (If more than one)				

Competencies*
Basic competencies
CB3: Students should be able to show that they are capable of collecting and interpreting the relevant data (normally within their area of study) needed for formulating judgments which require critical thought on social, scientific and ethical topics of relevance.
CB4: Students should be able to show that they are able to transmit information, ideas, problems and solutions both to specialized and non-specialized publics.
CB5: Students should be able to show that they have developed the learning skills required to perform further studies with a high degree of self-dependence.
General competencies:
CG4: Experimental and technology skills in their field of study.
CG5: Students should have the ability to check and appropriately correct (if discrepancies were observed) their own models.
CG6: Ability to apply learning to their professional career.
CG7: Foster the student's imagination and creativity inherent to the evolution of Science.
CG8: Ability to identify the ethical issues in scientific research. Ability to identify ethical needs in their professional work.

Cross curricula competencies:
CT4: Ability to critically evaluate their own learning process and professional activity, as well as to put into practice improvement strategies.
CT5: Develop the ability to defend their views through reasoned argument to make judgements in social, scientific or matters of ethics.
CT8: Ability to apply their knowledge in the business world.
CT9: Foreign language foundations (English preferred).
Specific competencies:
CE2: Have updated or cutting-edge knowledge in some fields of Physics.
CE3: Ability to identify key aspects of a complex physical system with the aim of implementation of simple but sufficiently descriptive models.
CE4: Have a good knowledge of the most commonly used numerical and mathematical methods.
CE10: Resolution of problems in physics.

Contents
Course outline*
Analog electronics blocks (amplifiers, power supplies, oscillators, filters). A/D and D/A converters. Fundamentals of digital systems.
Course syllabus
Name of lesson 1: Introduction to Electronics Contents of lesson 1: Introduction. Signals. Electronic systems. Passive components. Diodes. Transistors. Data sheets. Description of the practical activities of lesson 1: resolution of problems (1 h) and seminar on Circuits Theory (2h)
Name of lesson 2: Amplifiers Contents of lesson 2: Ideal amplifiers. Input and output resistances. Interconnection of amplifiers. Frequency response. Description of the practical activities of lesson 2: resolution of problems (1 h)
Name of lesson 3: Operational Amplifiers Contents of lesson 3: Introduction. Ideal and non-ideal operational amplifiers. Basic configurations. Real operational amplifiers. Description of the practical activities of lesson 3: resolution of problems (1 h) and seminar on LTSpice (2h)
Name of lesson 4: Active Filters Contents of lesson 4: Introduction. Types of filters. First order active filters. Second order active filters. Higher order filters. Description of the practical activities of lesson 4: resolution of problems (1 h)
Name of lesson 5: Oscillators and Signal Generators Contents of lesson 5: Introduction. Sinusoidal oscillators. Oscillators with operational amplifiers and RC networks. Multivibrators. Triangular and rectangular signal generators. Description of the practical activities of lesson 5: resolution of problems (1 h)

Name of lesson 6: Digital Electronics Fundamentals
Contents of lesson 6: General concepts. Digital Integrated Circuits. Numeral systems. Binary Arithmetic. Binary codes. Boolean algebra.
Description of the practical activities of lesson 6: resolution of problems (1 h)

Name of lesson 7: Combinational Systems Design
Contents of lesson 7: Introduction. Combinational systems implementation. Simplification of logical functions.
Description of the practical activities of lesson 7: resolution of problems (1 h)

Name of lesson 8: Combinational Logic Macro Functions **(taught in English)**
Contents of lesson 8: Comparators. Coders and Decoders. Code Converters. Multiplexers and Demultiplexers. Binary Adders and Subtractors. Arithmetic Logic Units.
Description of the practical activities of lesson 8: resolution of problems (1 h)

Name of lesson 9: Basic Sequential Systems
Contents of lesson 9: Introduction to sequential logic. Biestables. Registers. Counters.
Description of the practical activities of lesson 9: resolution of problems (1 h)

Name of lesson 10: Sequential Systems Design
Contents of lesson 10: Introduction. General Design Methodology. Sequence detectors. Mealy and Moore state machines.
Description of the practical activities of lesson 10: resolution of problems (1 h)

Name of lesson 11: Introduction to Data Acquisition Systems
Contents of lesson 11: Introduction. Input signal conditioning. Digital to Analog Conversion. Analog to Digital Conversion. Output signal conditioning.
Description of the practical activities of lesson 11: resolution of problems (1 h)

Educational activities

Student workload in hours by lesson		Lectures	Practical activities				Monitoring activity	Homework
Lesson	Total	L	HI	LAB	COM	SEM	SGT	PS
1	12	4				3		12
2	15	4				1		10
3	19	4				3		12
4	15	4				1		10
5	10	3				1		6
6	11	4				1		6
7	12	3				1		8
8	11	4				1		6
9	10	3				1		6
10	13	4				1		8
11	18	4				1		6
Assessment	4	4				0		0
TOTAL	150	45				15		90

L: Lectures (100 students)
HI: Hospital internships (7 students)
LAB: Laboratory or field practices (15 students)
COM: Computer room or language laboratory practices (30 students)
SEM: Problem classes or seminars or case studies (40 students)
SGT: Scheduled group tutorials (educational monitoring, ECTS type tutorials)
PS: Personal study, individual or group work and reading of bibliography

Teaching Methodologies

1. Contents explanation and discussion.
2. Problems resolution, analysis and discussion. Preparation, demonstration and defence of projects.
5. Students' autonomous work.

Learning outcomes

Ability to analyze and design analog and digital electronic systems.

Assessment systems

Students may choose between two assessment systems: continuous or global. The choice will be made according to the conditions set by the current evaluation regulations. If students do not make their choice, they will be assigned the continuous assessment system by default.

Continuous Assessment System

This system is based on two evaluation tools, as detailed in the next table:

Evaluation tool	Weight in the final grading	Type
Final written exam	75%	R
Resolution of problems and exercises	25%	NR

The first of these tools consists in a final written exam about all the theoretical and practical contents covered in the course, where the theoretical part will have a weight ≤ 30% in the exam grading. **A minimum grading of 4 out of 10 will be necessary in the exam in order to pass the course.** Those students who fail to pass this threshold with get the final grading FAIL (3.0).
The second evaluation tool consists in the resolution of different follow-up tasks that will be proposed by the instructor at the end of some Units. These tasks may involve solving a practical problem, searching for information and/or analysing and simulating a particular electronic system. Students MUST submit these tasks within the established period. The weight of this activity in the final grading will be 25%. This is a non-recoverable activity.

One evaluation tool consisting in a written exam will be used in the **extraordinary grading**, with a total weight of 75% in the final grading of the course. The remaining 25% will be obtained from the resolution of problems and exercises (follow-up tasks) performed during the course. As in the ordinary grading, **a minimum grading of 4 out of 10 will be necessary in the written exam in order to pass the course.** Those students who fail to pass this threshold with get the final grading FAIL (3.0).

Global Assessment System

This system will be composed of two parts:

1. A written exam with a total weight of 75% in the final grading of the course.

2. One or more design projects similar to those proposed in the follow-up tasks, with a total weight of 25% in the final grading.

A minimum grading of 4 out of 10 will be necessary in the written exam in order to pass the course. Those students who fail to pass this threshold with get the final grading FAIL (3.0).

Bibliography (basic and complementary)

In the following link:

*https://lope.unex.es/search~S7*spi?/r500786/r500786/1%2C1%2C2%2CB/frameset&FF=r500786&2%2C%2C2/indexsort=-*

Students can access the recommended bibliography that is available in the UEx library.

BASIC

- Adel S. Sedra and Kenneth C. Smith. *Microelectronics circuits,* 8th Edition, Oxford Univ. Press, 2020.
- Allan R. Hambley. *Electronics.* Prentice Hall, 2nd Edition, 1999.
- Charles H. Roth, Jr. *Fundamentals of Logic Design,* 7th Ed. Cengage Learning, 2015.
- Maurizio Di Paolo. *Data acquisition systems: from fundamentals to applied design*. Springer, 2013.
- Thomas L. Floyd. *Digital fundamentals,* 11th Edition, Pearson, 2015.

COMPLEMENTARY

- Gilles Brocard. *The LTSpice IV Simulator: manual, methods and applications*. Würth Elektronik, 2013.
- Herbert Taub. *Digital Circuits and Microprocessors,* Ed. McGraw-Hill, 1983
- Ignacio Del Villar and others. *Solved problems in digital electronics.* Marcombo, 2018.
- Jacob Millman and Arvin Grabel. *Microelectronics.* McGraw-Hill, 1988.
- Norbert R. Malik. *Electronic Circuits: Analysis, Simulation and Design, Prentice Hall, 1995*.

Other resources and complementary educational materials