PERSONA CIÈNCIA EMPRESA
Universitat Ramon Llull

TITLE OF COURSE: ELECTRONICS

MATTER: Fundamentals of Electrical, Electronics and Automation Engineering
MODULE: Common to Industry Branch
PROGRAM TITLE: Degree on Industrial Technologies Engineering

GENERAL CHARACTERISTICS*

Type: ☐ Basic training, ☑ Compulsory elective, ☐ Optional
☐ Final degree project, ☐ Practicum

Duration: Quarterly **Semester/s**: 5
Number of credits ECTS: 5
Language/s: Spanish

DESCRIPTION

BRIEF DESCRIPTION AND JUSTIFICATION (the meaning of the course in relation to the studies. Between 100 and 200 words.)

This course provides an overview of the fundamentals of electronics, and use the tools to be able to design, analyze and implement analogue electronic circuits.
One of the most significant technological advances of recent years has been the introduction of semiconductor devices, electronic integrated circuits staple. Its applications are increasing day by day due to its vast possibilities, so it is essential to the study and understanding.

COMPETENCES (of the course made in relation to preassigned competences in this area.)

• Ability to understand and apply basic technical knowledge. (E2).
• Knowledge of materials science and technology that enables them to learn new methods and theories and given a versatility to adapt to new situations (E3).
• Ability to solve problems with initiative, decision making, creativity, and critical thinking (E4).
• Ability to communicate effectively, both orally and in writing, to impart knowledge and skills in the field of industrial engineering. (T1)
• Knowledge of the fundamentals of electronics. (CRI5)
• Understanding the fundamentals of automation and control methods. (CRI6)

PREREQUISITES* (modules, matters, courses and knowledge needed to follow the course. Can be stated that courses must have been completed.)
Competences of the earlier educational stages.

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CONTENTS (as a relationship of the chapters that constitute the contents, or topics covered, of the course to a second level detail.)

1. Semiconductor: Basics of semiconductor.
2. diode:
- PN junction
- Feature diode
- Load Line: pto work
- Circuits with Diodes: rectifier
- AC small-signal analysis
- Special Diodes: Zener diode lights (LEDs), photodiodes and opto-couplers.
3. Bipolar transistor BJT (Bipolar Junction Transistor)
- Semiconductor bipolar transistor NPN / PNP
- Characteristics of the bipolar transistor: specifications (datasheets)
- Analysis DC
- Polarization bipolar transistor
- Load Line: pto work
- AC small-signal analysis: the transistor as an amplifier
- Model T and π equivalent
- A stage amplifiers: common emitter, common and common reader Col •
(Emitter follower).
- Power Mirrors: basic, with base current compensated mirror Wilson
mirror with multiple outputs
- Configuration Darlington
- The differential pair / differential amplifier
- Multistage amplifier
4. quadrupolar:
- Definition and classification
- Model I, Model Z, Model H, Model G, Model T
- Association of quadrupolar: cascading, serial connection, serial connection
• side by side • lel-lel • Parallel connection in parallel-series and series-parallel connection • Parallel
5. Unipolar field effect transistor: JFET (Junction Field Effect Transistor) and MOSFET (Metal-Oxide Semiconductor FET)
- Analysis DC
- Polarization JFET and MOSFET transistor
- Load Line: pto work
- AC small-signal analysis: the unipolar transistor JFET / MOSFET as an amplifier.
- Model equivalent
- Amplifier stage: Common Source, Common gate and common drain (source follower).
6. Amp:
- Characteristic Parameters in amp-op.
- Negative feedback op-amp: amp non-inverter voltage follower amplifier, inverter amplifier, comparator, adder, integrator stage, differential ...
- Positive feedback op-amp: Schmitt Trigger circuit.

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7. Frequency response:
- Active filters: low pass, high pass and band-pass
- Transfer function
- Bode diagrams

8. Introduction to power electronics (control and automation)
- Three phase rectifiers (thyristor control).
- Investors (AC / DC).
- Cicloconvertidors frequency.
- Switching Sources: choppers.
- Start live boot star / triangle and soft starters.
- Control of DC motors (DC-motors) for PWM with microcontroller.

METHODOLOGY

TRAINNING ACTIVITIES* (Complete the table relating activities, workload in ECTS credits, and competences.)

Training activities	**ECTS Credits**	**Competences**
Sessions presentation of concepts (A1)	1,5	E2, E3, E4,CRI5,CR6
Sessions for resolution of exercises, problems and cases (A2)	0,5	E2, E3, E4, CRI5
Seminars (A3)		
Personal mandatory activities professor-student (A4)	0,1	E2,E3,E4,CRI5,T1
Practical work / laboratory (A5)	1,2	E2,E3,E4,CRI5,T1
Oral and writing presentations (A6)		
Personal study activities by students (A7)	1,6	E2, E3, E4, CRI5,CRI6
Evaluation activities (exams, tests,…) (A8)	0,1	E2, E3, E4,CRI5
Jobs (A9)		
Visits to companies (A10)		
TOTAL	**5**	

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EXPLANATION OF THE TEACHING METHODOLOGY (justifying the teaching methods used in relation to the competences and course contents. Between 100 and 200 words.)

The teaching is done through lectures, problem solving classes, practical laboratory and weekly tasks by students outside of class to make (two or three issues a week).
Practical work in the laboratory consists of explanations by the professor of the tasks to be performed, along with delivery of the practice protocol and report writing by the student with the measurements and observations found.
For personal study the student is provided with complete documentation of the course theory, problems in laboratory testing protocols, and resolution of work per week by the student.

EVALUATION

EVALUATION METHODS* (Fill in the table relating evaluation methods, competences and weight in the qualification of the subject.)

Evaluation Methods	Weight	Competences
Final Exam (A)	40%	E2, E3, E4, CRI5
Examination / s Partial / s / control / s scheduled / s (B)	20%	E2, E3, E4, CRI5, CRI6
Activities done in class (C)	3%	E2, E3, E4, CRI5, T1
Exercises outside of class (D)	17%	E2, E3, E4, CRI5
Reports realizats work (E)	-	-
Presentations and / or oral examinations (F)	-	-
Modeling, Proposed, etc.. (G)	-	-
Laboratory reports (H)	10%	E2, E3, E4, CRI5, T1
Practical work / lab (I)	10%	E2, E3, E4, CRI5
Work in other centers (Practicum) (J)	-	-
Participations (K)	-	-

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LEARNING OUTCOMES (Explanation of the achievements of students that allow competences evaluation, relating to competences and evaluation methods.)

• The student must demonstrate theoretical knowledge of basic concepts in electronics. (E2, E3, E4, CRI5, CRI6)
• The student must demonstrate proficiency in understanding, planning, and resolution of electrical and electronic circuits. (E2, E3, E4, CRI5, CRI6)

QUALIFICATION (Explanation of the calculation system of qualifying the course.)

The course evaluation will consider all aspects of assessment in the table with its corresponding weight.
To pass the course you must have a minimum of five points. Each of the evaluation activities, including the final exam, must have a minimum grade average of 4 points for them with others.
Attendance at all laboratory sessions is mandatory. Breach of this rule, except in cases of force majeure, will discontinue the course in June and September. In the September students will examine the whole matter. The examination may include theory and lab.

EVALUATION OF COMPETENCES (Defining expressions of calculation for each competence based on corresponding evaluations activities.)

To evaluate the skills of the subject (E2, E3, E4, CRI5, T1) used methods of assessment exams, scheduled checks, monitoring tests and laboratory

TEXTBOOKS (recommended and accessible to students.)

• Norbert R Malik; “Circuitos Electrónicos: análisis, simulación y diseño”. Ed. Prentice Hall, 2000
• Sedra/Smith; “Microelectronic Circuits”. 6ª Ed. Oxford University Press, 2011.
• Millman/Grabel; “Microelectrónica”. 6ª Ed. Hispano Europea, 1993
• Malvino/Bates; “Principios de Electrónica”. 7ª Ed. McGraw-Hill, 2010
• Muhammad H. Rashid; “Fundamentals of power electronics”.

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HISTORICAL DOCUMENT

EARLIER CHANGES
February 2012. Associated Professor Sauro J. Yagüe

LAST REVISION

July 2012. Associated Professor Sauro J. Yagüe

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