Universitat de Lleida

DEGREE CURRICULUM

ELECTRONIC ENGINEERING BASICS

Coordination: SAIZ VELA, ALBERT

Academic year 2019-20

ELECTRONIC ENGINEERING BASICS 2019-20

Subject's general information

Subject name	ELECTRONIC ENGINEERING BASICS
Code	102334
Semester	2nd Q(SEMESTER) CONTINUED EVALUATION
Typology	

Degree	Course	Character	Modality
Not informed	2	COMPULSORY	Attendance-based
Bachelor's degree in Industrial Organization and Logistics Engineering	2	COMPULSORY	Attendance-based

Course number of credits (ECTS)	6
Type of activity, credits, and groups	

Activity type	PRALAB	PRAULA	TEORIA
Number of credits	1	2	3
Number of groups	3	2	2

Coordination	SAIZ VELA, ALBERT
Department	COMPUTER SCIENCE AND INDUSTRIAL ENGINEERING
Teaching load distribution between lectures and independent student work	30 hours classroom attendance (Theory) + 45 hours of self-guided work 20 hours classroom attendance (Praula) + 30 hours of self-guided work 10 hours classroom attendance (Pralab) + 15 hours of self-guided work TOTAL -> 6 ECTS credits (60h classroom attendance + 90h self-guided work)
Important information on data processing	Consult this link for more information.
Language	Catalan Some educational lectures can be written in Spanish or English
Distribution of credits	3 credits (Theory) + 2 credits (Praula) + 1 credit (Pralab) Theory -> Theory Class Praula -> Class of Problems / Classroom practices Pralab -> Practices in the laboratory

Teaching staff	E-mail addresses	Credits taught by teacher	Office and hour of attention
SAIZ VELA, ALBERT	albert.saiz@udl.cat	13	

Subject's extra information

You can find educational lectures on the Virtual Campus: http://cv.udl.cat

The use of the Virtual Campus is fundamental to access the resources of the subject, to notifications about the dates of delivery of exercises, delivery of practices and evaluation tests.

It is **COMPULSORY** that the students bring the following elements of individual protection (EPI) to the practices at the laboratory.

- Laboratory gown from UdL
- Protection glasses
- Mechanical protection gloves

They can be purchased through the shop Údels of the UdL:

C/ Jaume II, 67 baixos
Centre the Cultures i Cooperació Transfronterera

http://www.publicacions.udl.cat/

There will be a specific service for the *Campus Universitari d'Igualada*.

The use of other elements of protection (for example caps, masks, gloves of chemical or electrical risk, etc.) will depend on the type of practice to be done. In that case, the teacher will inform of the necessity of specific EPI.

Not bringing the EPI's described or not fulfilling the norms of general security that are detailed below imply that the student can not access to the laboratories or have to go out of them. The no realisation of the practices for this reason imply the **consequences in the evaluation** of the subject that are described in this course guide.

GENERAL NORMS OF SECURITY IN LABORATORY PRACTICES

- Keep the place of realisation of the practices clean and tidy. The table of work has to be free from backpacks, folders, coats...
- No short trousers or short skirts are allowed in the laboratory.
- Closed and covered footwear is compulsory in the laboratory.
- Long hair needs to be tied.
- Keep the laboratoy gown laced in order to be protected from spills of chemicals.
- Bangles, pendants or wide sleeves are not allowed as they can be trapped.
- Avoid the use of contact lenses, since the effect of the chemical products is much bigger if they enter between the contact lense and the cornea. Protection over-glasses can be purchased.
- No food or drink is allowed in the laboratory.
- It is forbidden to smoke in the laboratories.
- Wash your hands whenever you have contact with a chemical product and before going out of the laboratory.
- Follow the instructions of the teacher and of the laboratory technicians and ask for any doubt on security.

For further information, you can check the following document of the *Servei de Prevenció de Riscos Laborals de la UdL*: http://www.sprl.udl.cat/alumnes/index.html

ELECTRONIC ENGINEERING BASICS 2019-20

Learning objectives

Once the course is finished and passed, students should be able to:

- Use the nomenclature and the technical language in the description of the electrical behavior of electronic components and systems.
- Recognize the basic properties and parameters of the elemental signals that are used in electronic circuits and manage their units.
- Recognize the function, basic characteristics and models of the active electronic components (diode, bipolar and unipolar transistor) in an electronic circuit.
- Identify the block diagram of simple electronic systems.
- Identify and distinguish the model and the basic properties of amplifiers and use ideal operational amplifiers for their implementation.
- List and define the main features of the functional blocks that compose a basic electronic system (amplifier, comparator, attenuator, power supply, ADC, DAC, etc.).
- Analyze, implement and design analog circuits, combinational digital circuits and simple sequential digital circuits. Mount electronic circuits and check its operation. Develop a simple system based on a microcontroller.
- Manage information, identify / locate and access / use the information search tools, organize information and make good use.
- Write reports in relation to the knowledge learned by managing the correct time and sources of information to achieve the learning objectives.
- Use of the scientific terminology of the subject in English.

Competences

Specific competences

CE11 Conceptualize the fundamentals of electronics

Transversal Competences

CT2. Develop meaningful command of a foreign language, especially English.

CT3. Implement new technologies and technologies of information and communication.

CT4. Apply basic knowledge of entrepreneurship and professional environments.

CT5. Apply essential notions of scientific thinking.

Subject contents

T1 Introduction to electronic systems

- Basic concepts of electronics and historical evolution
- Active / passive components of an electronic system
- Analog, digital and mixed systems (A/D, D/A): circuits and applications
- Implementation of electronic systems: integrated circuits and printed circuit boards (PCBs)
- Integration of electronic systems: embedded systems and others

T2 Digital electronics basics

- Digital information and coding
- Logic gates, logic families and digital integration technologies
- Boolean algebra and simplification of boolean functions
- Combinational and sequential logic systems
- Conversion A/D and D/A
- Microcontrollers: I/O interfaces, sensors, actuators and displays

T3 Analog electronics basics

- The operational amplifier
- Feedback
- Amplifier circuits
- Comparators
- Oscillators

T4 Semiconductor devices

- Semiconductors
- Diodes
    - Principles of the PN junction . Direct/reverse biasing.
    - Types of diodes and Circuits with diodes.
    - Power supply systems based on the use of diodes: rectification and filtering
- Bipolar transistors
    - Biasing and characteristics.
    - Behaviour and basic circuits. Applications
    - Phototransistors and optocouplers.
- Field effect transistors (J-FET and MOSFET)
    - Biasing and characteristics.
    - Behaviour and basic circuits. Applications

Joint project: Project between 3 subjects of 2nd year GEM / GEOIL degrees: Fluid Mechanics, Industrial Automation and Electronic Engineering Basics.

Methodology

The teaching methodology is divided into five different strategies depending on the teaching-learning activities to be carried out:

Master class / **Participative exhibition sessions**: Sessions where the learning process is centered on the oral presentation by the teacher about the contents of the subject. The exhibition is done using the blackboard and / or computer resources. When transparencies are used, they will be previously available in the virtual campus of the UdL. Short-term activities will be introduced to encourage debate and student participation.

Problem solving: Sessions related to solving exercises and / or carrying out work where the learning process is centered on the students. A problem or exercise is posed and the students are responsible for solving it by applying routines, formulas, the application of procedures and / or carrying out simulations. The students will carry out these tasks both individually and as a team. For group activities, strategies to encourage cooperative work will be used.

Practical sessions: These sessions will be held in the computer room and in the laboratory of the subject in relation to the activities of simulation and / or implementation of the practical activities of the subject in the laboratory.

Problem-based learning: Students are offered a problem that must be solved in a guided manner, providing partial information and then experimentally mounting. The solution will be made by developing an application that contains the different parts of an electronic instrumentation system. The script and other necessary documentation to carry out the activity will be available in the Virtual Campus.

Joint Project: in the Joint Project of 2nd year 2nd semester the following subjects are involved: Fluid Mechanics, Industrial Automation and Electronic Engineering Basics. The project coordinator will monitor the tasks to be submitted, as outlined in the timeline provided at the beginning of the course. All the subjects involved in the project will be registered jointly. In the circumstance that the students might have passed more than 50% of the subjects involved in the project, they will be allowed to write an equivalent project focused on the subject they are currently taking.

Development plan

Week	Contents	Methodology	Classroom attendance	Self-guided work
1-2-3	T1,T2	Master class / Problem solving	12h	18h
4	T2	Master class + **Lab 1**	4h	6h
5	T2+ Joint PR	Master class / Problem solving + Joint PR (1h)	4h	6h
6	T3	Master class / Problem solving	4h	6h
7	T3 + Joint PR	Master class / Problem solving+ midterm presentation Joint PR (2h)	4h	6h
8	T3	Sesión expositiva / Problemas + **Lab 2**	4h	6h
9	1rst evaluation exam		2h	3h
10	T4	Master class / Problem solving	4h	6h
11	T4	Master class / Problem solving + **Lab 3**	4h	6h
12	T4	Master class / Problem solving	4h	6h
13	T4	Master class / Problem solving + **Lab 4**	4h	6h
14	T4	Master class / Problem solving + **Lab 5**	4h	6h
15	T4	Master class / Problem solving	4h	6h
16	2nd evaluation exam		2h	3h

TOTAL classroom attendance--> 60h / **TOTAL self-guided work**-> 90h

Evaluation

The process of evaluation of the subject follows the system of continuous evaluation and will consist of the following activities:

- **EX1** Exam (theory and problems) 1st part (Weight in the final evaluation -> 30%) (2 hours)
- **EX2** Exam (theory and problems) 2nd part (Weight in the final evaluation -> 35%) (2h duration)
- **LAB** Assessable practices / Laboratory reports (Weight in the final evaluation -> 10%)
- **PRO** Resolution of questionnaires in class, problems / simulation of exercises via virtual campus, tests, work to be delivered on a specific date, etc ... (Weight in the final evaluation -> 10%)
- **PI** Joint Project or **TE** Equivalent work (Weight in the final evaluation -> 15%)

The FINAL Grade of the subject is determined by the following formula:

FINAL Grade= 0.30 **x EX1 +** 0.35 **x EX2 +** 0.10 **x PRO +** 0.10 **x LAB +** 0.15 **x (PI or TE)**

- In order for the **EX1** and **EX2** exams to be included in the FINAL Grade formula, the minimum mark obtained in each exam should be **> = 4 (greater or equal to 4)**.
- Students have the right to recover any evaluation activity that is equal to or greater than 30% of the final mark in a subject or subject, except for the practices of the subject, if applicable (according to the assessment regulations and qualification of the UdL). That is, if a student fails (note <5, less than 5) the

EX1 exam and / or the **EX2** exam has the right to recover them (if you want) during the Recovery evaluation period.

- In no case any **PRO**, **LAB** and / or **PI** or **TE** activity can be deliverded in the Recovery evaluation period in order to be evaluated during this period.
- The subject is passed when FINAL Grade > = 5 greater or equal to 5).

Bibliography

Storey, Neil, "Electronics: a systems approach", 4th edition. Edimburgh. Pearson Education, 2009.
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Wakerly, John F. "Diseño digital : principios y prácticas", 3rd edition. México. Pearson Educación, 2001.
Malvino, Albert; Bates, David J., "Principios de electrónica", 7th edition. Madrid: McGraw-Hill, 2007.
Coughlin, Robert F.; Driscoll, Frederick F, "Amplificadores operacionales y circuitos integrados lineales" 3rd edition. México. Prentice-hall Hispano Americana, 1999.
A.S. Sedra, K.C. Smith, “Circuitos microelectrónicos”, 5th edition, Oxford University Press, 2006.
Allan R. Hambley, "Electrónica", Pearson Educación, 2001.
R. Boylestad, Louis Nashelsky, " Electrónica: teoría de circuitos", 11th edition, Addison-Wesley, 2018

Adaptations to the contents due to COVID-19

The theoretical explanations and the resolution of exercises will be carried out through **audiovisual lessons** that will be recorded and can be consulted through the Virtual Campus.

The lab exercicies of the subject will be carried out through the **on-line modality** using a free electronic circuit simulator that is available on the internet.

Each week there will be "face-to-face" classes in online mode using the **Videoconference tool**, which will also be recorded and consulted on the Virtual Campus, to answer questions, follow up on the subject, etc ... and will also use the Virtual Campus **Forum** to resolve any type of doubts.

Adaptations to the evaluation due to COVID-19

The process of evaluation of the subject follows the system of continuous evaluation and will consist of the following activities:

- Exercices **EX1-Q1, EX1-Q2 i EX1-Q3** which will be evaluated on-line and **must be delivered within a pre-defined data and hour through the Virtual Campus** (Weight in the final evaluation -> 10% each exercice)
- **EX2** Exam (theory and problems). The exam will take place **on-line** in the date and hour fixed by the exams calendar (2n evaluation period) of EPS-UdL. (Weight in the final evaluation -> 35%)
- **LAB** Assessable practices / Laboratory reports and **must be delivered within a pre-defined data and hour through the Virtual Campus** (Weight in the final evaluation -> 10%)
- **PRO** Resolution of questionnaires in class, problems / simulation of exercises via virtual campus, tests, work to be delivered on a specific date, etc ... (Weight in the final evaluation -> 10%)
- **PI** Joint Project or **TE** Equivalent work (Weight in the final evaluation -> 15%)

The FINAL Grade of the subject is determined by the following formula:

FINAL grade = 0,10 x **EX1-Q1** +0,10 x **EX1-Q2** + 0,10 x **EX1-Q3** + 0,35 x **EX2** + 0,10 x **PRO** + 0,10 x **LAB** + 0,15 x (**PI** or **TE**)

- In order to include **EX2** results in the FINAL Grade formula, the minimum mark obtained should be **> = 4 (greater or equal to 4)**.
- Students have the right to recover any evaluation activity that is equal to or greater than 30% of the final mark in a subject or subject, except for the practices of the subject, if applicable (according to the assessment regulations and qualification of the UdL).
    - If a student fails (note <5, less than 5) the **EX2** exam, he/she has the right to recover it (if desired)

during the Recovery evaluation period.

- **EX1-Q1, EX1-Q2, EX1-Q3, PRO, LAB** i/o **PI** o **TE** will NOT be re-evaluated during the Recovery evaluation period since the weight of these activities is below 30% in each case.

- The subject is passed if the FINAL Grade > = 5 greater or equal to 5) **and the Joint Project or the Equivalent Work has been completed and delivered succesfully.**
- If the Joint Project or the Equivalent Work is not completed and delivered the FINAL Grade of the subject will be **Absent (No presentat)**