



Universitat de Lleida

DEGREE CURRICULUM

ELECTRONIC ENGINEERING

BASICS

Coordination: SAIZ VELA, ALBERT

Academic year 2023-24

Subject's general information

Subject name	ELECTRONIC ENGINEERING BASICS			
Code	102334			
Semester	2nd Q(SEMESTER) CONTINUED EVALUATION			
Typology	Degree	Course	Character	Modality
	Bachelor's degree in Industrial Organization and Logistics Engineering	2	COMPULSORY	Attendance-based
	Common branch in industrial engineering programs - Igualada	2	COMPULSORY	Attendance-based
	Doble titulació: Grau en Enginyeria en Organització Industrial i Logística i Grau en Administració i Direcció d'Empreses	3	COMPULSORY	Attendance-based
	Not informed	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	1	1
Coordination	SAIZ VELA, ALBERT			
Department	INDUSTRIAL AND BUILDING 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	8	

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 laboratory 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>

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

General competences

B01 That students have demonstrated to possess and understand knowledge in an area of study that starts from the base of general secondary education, and is usually found at a level that, although supported by advanced textbooks, also includes some aspects that imply knowledge coming from the vanguard of his/her field of study.

B02 That students know how to apply their knowledge to their work or vocation in a professional manner and possess the skills that are usually demonstrated through the elaboration and defense of arguments and the resolution of problems within their area of study.

B03 That students have the ability to gather and interpret relevant data (usually within their area of study) to make judgments that include a reflection on relevant social, scientific or ethical issues.

B04 That students can transmit information, ideas, problems and solutions to a specialized and non-specialized public.

B05 That students have developed those learning skills necessary to undertake further studies with a high degree of autonomy

Transversal competences

CT2. To develop meaningful command of a foreign language, especially English.

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

CT4. To apply basic knowledge of entrepreneurship and professional environments.

CT5. To apply essential notions of scientific thinking.

General competences

CG1. To conceptualize the drafting, signing and development of projects in the field of engineering in industrial organization, which have as their object, according to the specific technology training, the construction, reform,

repair, conservation, demolition, manufacture, installation, assembly or exploitation of: structures, mechanical equipment, energy facilities, electrical and electronic installations, industrial facilities and processes and manufacturing and automation processes.

CG3. To synthesize basic and technological subjects, which enable them to learn new methods and theories, and provide them with versatility to adapt to new situations.

CG4. To solve problems with initiative, make decisions, creativity, critical reasoning and to communicate and transmit knowledge, skills and abilities in the field of Industrial Chemical Engineering.

CG5. To carry out measurements, calculations, valuations, appraisals, surveys, studies, reports, work plans and other analogous work.

CG6. To implement specifications, regulations and mandatory rules.

CG10. To work in a multilingual and multidisciplinary environment.

Specific competences

CE11. Conceptualize the fundamentals of electronics

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 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

T3 Analog electronics basics

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

T4 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

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.

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	Self-guided work
1-2-3	T1,T2	Master class / Problem solving	12h	18h
4	T2	Master class + Lab 1	4h	6h
5	T2	Master class / Problem solving	4h	6h
6	T2	Master class / Problem solving	4h	6h
7	T2	Master class / Problem solving	4h	6h
8	T2	Master class / Problem solving	4h	6h
9	1rst evaluation exam		2h	3h
10	T2	Master class + Lab 2	4h	6h
11	T3	Master class + Lab 3	4h	6h
12	T3	Master class / Problem solving	4h	6h
13	T4	Master class + Lab 4	4h	6h
14	T4	Master class + Lab 5	4h	6h
15	T4	Master class / Problem solving	4h	6h

16,17 and 18	2nd evaluation exam		2h	3h
19	Seminars			
20	Recovery exam			

TOTAL hours Campus --> 60h / TOTAL hours 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%)
- **EX2** Exam (theory and problems) 2nd part (Weight in the final evaluation -> 40%)
- **LAB** Assessable practices / Laboratory reports (Weight in the final evaluation -> 10%)
- **PI** Joint Project or **TE** Equivalent work (Weight in the final evaluation -> 20%)

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

$$\text{FINAL Grade} = 0.30 \times \text{EX1} + 0.40 \times \text{EX2} + 0.10 \times \text{LAB} + 0.20 \times (\text{PI or TE})$$

- 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).
- In no case any **LAB** and / or **PI** or **TE** activity can be delivered 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).

Students who have the approval to be assessed through **alternative evaluation** (see requirements and procedure in the assessment regulations) must carry out the following activities

- **EXTOTAL** Exam (theory and problems) 1st part and 2nd part (Weight in the final evaluation -> 70%)
- **LAB** Pràctiques avaluables / Informes de laboratori (Pes en l'avaluació final -->10%)
- **PI** Joint Project or **TE** Equivalent work (Weight in the final evaluation -> 20%)

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

$$\text{FINAL Grade} = 0.70 \times \text{EXTOT} + 0.10 \times \text{LAB} + 0.20 \times (\text{PI or TE})$$

- 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).
- In no case any **LAB** and / or **PI** or **TE** activity can be delivered in the Recovery evaluation period in order to be evaluated during this period
- L'assignatura queda aprovada quan Qualificació FINAL ≥ 5 (major o igual que 5).
- The subject is passed when FINAL Grade ≥ 5 (greater or equal to 5).

Bibliography

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 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.

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