Course guide
330105 - ED - Digital Electronics

Last modified: 25/05/2026

Unit in charge: Manresa School of Engineering
Teaching unit: 750 - EMIT - Department of Mining, Industrial and ICT Engineering.

Degree: BACHELOR'S DEGREE IN CHEMICAL ENGINEERING (Syllabus 2016). (Optional subject).
BACHELOR'S DEGREE IN INDUSTRIAL ELECTRONICS AND AUTOMATIC CONTROL ENGINEERING (Syllabus 2016). (Compulsory subject).
BACHELOR'S DEGREE IN MECHANICAL ENGINEERING (Syllabus 2016). (Optional subject).
BACHELOR'S DEGREE IN AUTOMOTIVE ENGINEERING (Syllabus 2017). (Optional subject).
BACHELOR'S DEGREE IN MINERAL RESOURCE ENGINEERING AND MINERAL RECYCLING (Syllabus 2021). (Optional subject).

Academic year: 2026 **ECTS Credits:** 6.0 **Languages:** Catalan, English

LECTURER

Coordinating lecturer:

Others: Van Der Velde, Oscar Arnoud

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:
1. (ENG) La capacitat d'especificar, analitzar, dissenyar, avaluar i documentar circuits digitals, tant seqüencials com combinacionals, així com les seves alternatives d'implementació.
2. The ability to use the tools and languages of specification, synthesis and verification of electronic circuits.
3. The knowledge and ability to use existing tools and instrumentation for the analysis, design, development and verification of electronic, computer and communications systems.

Transversal:
6. EFFECTIVE USE OF INFORMATI0N RESOURCES - Level 3. Planning and using the information necessary for an academic assignment (a final thesis, for example) based on a critical appraisal of the information resources used.
5. EFFICIENT ORAL AND WRITTEN COMMUNICATION - Level 2. Using strategies for preparing and giving oral presentations. Writing texts and documents whose content is coherent, well structured and free of spelling and grammatical errors.
4. SELF-DIRECTED LEARNING - Level 2: Completing set tasks based on the guidelines set by lecturers. Devoting the time needed to complete each task, including personal contributions and expanding on the recommended information sources.

TEACHING METHODOLOGY

The subject consists of face-to-face activities consisting of 3 hours per week of class and 2 hours per fortnight of laboratory practices.
The student carries out learning through various mechanisms. In the lectures and participative classes the contents of the subject are presented and the interaction between students and teacher is facilitated. Individual / group personal work activities are also proposed that should contribute to the understanding of the subject.
In laboratory classes, students carry out preliminary work that helps to put into context the work that is intended to be carried out in the laboratory. The laboratory activity itself is developed in groups of two students and allows experimentation with certain aspects developed in the subject. The writing of the memory and the interaction with the teacher in the laboratory allows working on the oral and written communication skills.
On a regular basis, technical documentation in English of digital electronic circuits is used, contributing to the learning of this language.

LEARNING OBJECTIVES OF THE SUBJECT

Upon completion of the student's Digital Electronics course:

- You will know the fundamentals of combinational and sequential logic and will be able to analyze and design simple combinational and sequential circuits.
- You will be able to write simple technical reports and present them orally.

STUDY LOAD

Type	Hours	Percentage
Hours small group	15,0	10.00
Self study	90,0	60.00
Hours large group	45,0	30.00

Total learning time: 150 h

CONTENTS

1. BINARY CODES

Description:
This topic presents the binary codes used to encode information in digital systems as well as their applications.

Related activities:
All.

Full-or-part-time: 9h
Theory classes: 3h
Self study : 6h

2. INTEGRATED DIGITAL CIRCUITS

Description:
This topic presents the implementation techniques of digital integrated circuits, the different technologies used and their static and dynamic characteristics.

Related activities:
All.

Full-or-part-time: 11h
Theory classes: 3h
Practical classes: 2h
Self study : 6h

3. COMBINATIONAL LOGIC

Description:
In this topic it is intended that the student can:
- Know and remember the main combinational elements and know the logical functions they perform.
- Combine combinational elements to achieve higher complexity functions.
- Recognize equivalences between combinational circuits and know the principles for the design of combinational circuits with minimal complexity.

Related activities:
All.

Full-or-part-time: 60h
Theory classes: 18h
Practical classes: 6h
Self study : 36h

4. SEQUENTIAL LOGIC

Description:
In this topic it is intended that the student can:
- Know and remember the main elements of memory (latches and flip-flops) and how to design state machines.
- Know and know how to use standard sequential blocks, such as counters and shift registers.

Related activities:
All.

Full-or-part-time: 70h
Theory classes: 21h
Practical classes: 7h
Self study : 42h

ACTIVITIES

1. EXPOSURE AND PROBLEM CLASS

Description:
In the classes the theoretical aspects of the subject will be developed. These will allow interaction between the students and the teacher.

Specific objectives:
- Know and remember binary codes and their applications.
- Know and know how to use the static and dynamic characteristics of digital integrated circuits.
- Know and remember the main combinational elements and know the logical functions they perform.
- Combine combinational elements to achieve higher complexity functions.
- Recognize equivalences between combinational circuits and know the principles for the design of combinational circuits with minimal complexity.
- Know and remember the main elements of memory and the functions they perform.
- Know and know how to use standard sequential blocks, such as counters and shift registers.

Material:
Published teaching material.
Recommended bibliography.

Delivery:
Occasionally some evaluable activity will be carried out, which will contribute in a proportional part to the EXE variable.

Full-or-part-time: 40h
Theory classes: 40h

2. LABORATORY CLASS

Description:
The practices to be carried out in the laboratory will be two hours a fortnight, in groups of two people. The student will have the statement of the practice that must be posted in the Athena. The laboratory will have a computer equipped with the necessary software to simulate digital components. Likewise, the necessary hardware will be available to experiment on commercial digital devices. The teacher will monitor the student's evolution in particular. At the end of each practice, each group will send an email to the practice teacher attaching a file where the work done and the knowledge acquired will be explained.

Specific objectives:
- Implement simple combinational and sequential circuits in the laboratory.
- Validate the operation of digital circuits of moderate complexity.
- Write and present documents reflecting the process of design and validation of digital circuits of moderate complexity.

Material:
Electronic equipment, breadboard, digital devices, computer with suitable software.
Statement of the practice and supporting information to carry out the work.

Delivery:
Before carrying out the practice, students will deliver the previous individual study corresponding to the practice to be carried out.
During the session, the achievement of the objectives of each laboratory session will be assessed, taking into account the degree of understanding of the work demonstrated by each student.
At the end of the session, each working group will prepare a final report that reflects the main features of the actual work.
The qualification obtained in these activities configures the LAB variable.

Full-or-part-time: 25h
Laboratory classes: 15h
Self study: 10h

3. INDIVIDUAL / GROUP PERSONAL WORK

Description:
The student must develop certain activities personally to achieve the objectives of the subject.

Specific objectives:
All of the subject.

Material:
Published teaching material.
Recommended bibliography.

Delivery:
Individual / group personal work will be translated, in part, into exercises during the course. The grading of these exercises will contribute to the EXE variable.

Full-or-part-time: 50h
Self study: 50h

4. TESTS

Description:
During the course, two individual control tests will be carried out (variables CON1 and CON2). After the course, there will be a final test where the CON1 and / or CON2 evaluations can be recovered.

Material:
Test statements.

Full-or-part-time: 35h
Theory classes: 5h
Self study: 30h

GRADING SYSTEM

Any academic fraud, plagiarism or use or possession of unauthorised means in an assessment activity leads to a mark of zero (0) for the affected test or assignment. Furthermore, in accordance with the University's regulations, if disciplinary proceedings are initiated the subject is recorded as "Pending Assessment" until a decision is reached. These incidents are managed in accordance with the **Action Framework for Academic Integrity in Assessment at the UPC**.

The final grade for the course will be obtained as follows:

Final mark = 0.4 * CON1 + 0.4 * CON2 + 0.1 * EXE + 0.1 * LAB

Note 1. The qualification in a part or in the whole of the final test will replace, if it is higher and there is a coincidence in the evaluated aspects, the results obtained in other evaluation acts carried out throughout the course.
Note 2. When the results of the evaluation acts corresponding to individual activities are substantially lower than those obtained in group activities, the individual execution of activities similar to those carried out in a group may be required. The last qualification will replace the original ones.

EXAMINATION RULES.

In the case of laboratory activities for which a previous study has been established, it will be mandatory to submit it before accessing the laboratory.
Those activities that are explicitly declared as individual, whether in person or not, will be carried out without any collaboration from other people.
The dates, formats and other delivery conditions that are established will be mandatory.

BIBLIOGRAPHY

Basic:

- Harris, David M.; Harris, Sarah L. Digital design and computer architecture [on line]. 2nd ed. Amsterdam: Elsevier, 2013 [Consultation: 10/06/2022]. Available on: https://www-sciencedirect-com.recursos.biblioteca.upc.edu/book/9780123944245/digital-design-and-computer-architecture. ISBN 9780123944245.

- Floyd, Thomas L. Fundamentos de sistemas digitales [on line]. 11a ed. Madrid: Pearson Educación, 2016 [Consultation: 07/06/2022]. Available on: https://www-ingebook-com.recursos.biblioteca.upc.edu/ib/NPcd/IB_BooksVis?cod_primaria=1000187&codigo_libro=6120. ISBN 9788490353004.

- Wakerly, John F. Diseño digital: principios y prácticas [on line]. 3ª ed. México: Pearson Educación, 2001 [Consultation: 19/02/2024]. Available on: https://ebookcentral-proquest-com.recursos.biblioteca.upc.edu/lib/upcatalunya-ebooks/detail.action?pq-origsite=primo&docID=5581923. ISBN 9701704045.

- Katz, R. H.; Boriello, G. Contemporary logic design. 2nd ed. Upper Saddle River: Pearson, 2005. ISBN 0131278304.