Course guide
820224 - ELDI - Digital Electronics

Last modified: 04/06/2026

Unit in charge: Barcelona East School of Engineering
Teaching unit: 710 - EEL - Department of Electronic Engineering.

Degree: BACHELOR'S DEGREE IN INDUSTRIAL ELECTRONICS AND AUTOMATIC CONTROL ENGINEERING (Syllabus 2009). (Compulsory subject).

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

LECTURER

Coordinating lecturer: SERGIO GÓMEZ FERNÁNDEZ

Others:

Primer quadrimestre:
SERGIO GÓMEZ FERNÁNDEZ - Grup: M11, Grup: M12, Grup: M13, Grup: M14, Grup: M21, Grup: M22, Grup: M23, Grup: M24
PILAR FRANCISCA LUIS PEÑA - Grup: M12, Grup: M21, Grup: M22, Grup: M23, Grup: M24
IRINA SELIN LORENZO - Grup: M11, Grup: M13, Grup: M14

Segon quadrimestre:
RAFEL MANERA ESCALERO - Grup: T11, Grup: T12, Grup: T13, Grup: T14
IRINA SELIN LORENZO - Grup: T11, Grup: T12, Grup: T13, Grup: T14

PRIOR SKILLS

Basic knowledge of digital electronics.
Oral and written expression. Level 2

REQUIREMENTS

SISTEMES ELECTRÒNICS - Prerequisit

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:
2. Understand the fundamentals and applications of digital electronics and microprocessors.
1. Design analogue, digital and power systems.

Transversal:
3. EFFICIENT ORAL AND WRITTEN COMMUNICATION - Level 3. Communicating clearly and efficiently in oral and written presentations. Adapting to audiences and communication aims by using suitable strategies and means.

TEACHING METHODOLOGY

The metodoly is based in lectures and exercises that are proposed regularly to be done in the classroom and out of it. Also, laboratory exercises are done every two weeks at the laboratories of the subject.

LEARNING OBJECTIVES OF THE SUBJECT

Acquire the fundamental concepts of digital circuit design tools and platforms available to perform them.

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

Introduction and review of previous concepts

Description:
Brief overview of the knowledge acquired in the course Electronic Systems

Related competencies :
CEEIA-21. Understand the fundamentals and applications of digital electronics and microprocessors.
04 COE N3. EFFICIENT ORAL AND WRITTEN COMMUNICATION - Level 3. Communicating clearly and efficiently in oral and written presentations. Adapting to audiences and communication aims by using suitable strategies and means.

Full-or-part-time: 7h 30m
Theory classes: 3h
Self study : 4h 30m

High Level Hardware Design Basics

Description:
Introduction and basics of digital electronic system design using high-level descriptions and programmable logic devices.

Related competencies :
CEEIA-21. Understand the fundamentals and applications of digital electronics and microprocessors.
04 COE N3. EFFICIENT ORAL AND WRITTEN COMMUNICATION - Level 3. Communicating clearly and efficiently in oral and written presentations. Adapting to audiences and communication aims by using suitable strategies and means.

Full-or-part-time: 11h 15m
Theory classes: 1h 30m
Laboratory classes: 3h
Self study : 6h 45m

Combinational blocks

Description:
Description, operation and use of common combinational blocks.

Related competencies :
CEEIA-21. Understand the fundamentals and applications of digital electronics and microprocessors.
04 COE N3. EFFICIENT ORAL AND WRITTEN COMMUNICATION - Level 3. Communicating clearly and efficiently in oral and written presentations. Adapting to audiences and communication aims by using suitable strategies and means.

Full-or-part-time: 16h 15m
Theory classes: 4h 30m
Laboratory classes: 2h
Self study : 9h 45m

Sequential blocks

Description:
Description, operation and use of basic common sequential blocks.

Related competencies :
CEEIA-21. Understand the fundamentals and applications of digital electronics and microprocessors.
04 COE N3. EFFICIENT ORAL AND WRITTEN COMMUNICATION - Level 3. Communicating clearly and efficiently in oral and written presentations. Adapting to audiences and communication aims by using suitable strategies and means.

Full-or-part-time: 16h 15m
Theory classes: 4h 30m
Laboratory classes: 2h
Self study : 9h 45m

Sequential Systems

Description:
Analysis and design of sequential systems of medium complexity.

Related competencies :
CEEIA-21. Understand the fundamentals and applications of digital electronics and microprocessors.
04 COE N3. EFFICIENT ORAL AND WRITTEN COMMUNICATION - Level 3. Communicating clearly and efficiently in oral and written presentations. Adapting to audiences and communication aims by using suitable strategies and means.

Full-or-part-time: 16h 15m
Theory classes: 4h 30m
Laboratory classes: 2h
Self study : 9h 45m

Finite State Machines (FSM)

Description:
Analysis and Design of Finite State Machines

Related competencies :
CEEIA-21. Understand the fundamentals and applications of digital electronics and microprocessors.
04 COE N3. EFFICIENT ORAL AND WRITTEN COMMUNICATION - Level 3. Communicating clearly and efficiently in oral and written presentations. Adapting to audiences and communication aims by using suitable strategies and means.

Full-or-part-time: 18h 30m
Theory classes: 4h 30m
Laboratory classes: 2h
Self study : 12h

Arithmetic Systems and Binary Arithmethics

Description:
Description and use of the numerical systems used in digital electronics. Analysis and design of arithmetic blocks.

Full-or-part-time: 7h 30m
Theory classes: 3h
Self study : 4h 30m

Electrical characteristics

Description:
Description of voltage levels and delays of logic gates and digital blocks. Calculation of limit working electrical conditions.

Related competencies :
CEEIA-21. Understand the fundamentals and applications of digital electronics and microprocessors.
04 COE N3. EFFICIENT ORAL AND WRITTEN COMMUNICATION - Level 3. Communicating clearly and efficiently in oral and written presentations. Adapting to audiences and communication aims by using suitable strategies and means.

Full-or-part-time: 12h 30m
Theory classes: 3h
Laboratory classes: 2h
Self study : 7h 30m

Memories and Programmable Logic Devices

Description:
Description and use of the most common logic memories. Overview of different possible realizations of digital circuits using the various existing commercial programmable devices (CPLD and FPGA).

Related competencies :
CEEIA-24. Design analogue, digital and power systems.
CEEIA-21. Understand the fundamentals and applications of digital electronics and microprocessors.
04 COE N3. EFFICIENT ORAL AND WRITTEN COMMUNICATION - Level 3. Communicating clearly and efficiently in oral and written presentations. Adapting to audiences and communication aims by using suitable strategies and means.

Full-or-part-time: 12h 30m
Theory classes: 3h
Laboratory classes: 2h
Self study : 7h 30m

Algorithmic State Machines (ASM)

Description:
Analysis and Design of Algorithmic State Machines. The datapath and the control unit.

Related competencies :
CEEIA-24. Design analogue, digital and power systems.
CEEIA-21. Understand the fundamentals and applications of digital electronics and microprocessors.
04 COE N3. EFFICIENT ORAL AND WRITTEN COMMUNICATION - Level 3. Communicating clearly and efficiently in oral and written presentations. Adapting to audiences and communication aims by using suitable strategies and means.

Full-or-part-time: 15h
Theory classes: 6h
Self study : 9h

The Microprocessor

Description:
Introduction to the microprocessor system and its internal architecture.

Related competencies :
CEEIA-24. Design analogue, digital and power systems.
CEEIA-21. Understand the fundamentals and applications of digital electronics and microprocessors.
04 COE N3. EFFICIENT ORAL AND WRITTEN COMMUNICATION - Level 3. Communicating clearly and efficiently in oral and written presentations. Adapting to audiences and communication aims by using suitable strategies and means.

Full-or-part-time: 15h
Theory classes: 6h
Self study : 9h

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**.

End mark = 0.20*(lab)+0.20*(practical exercises)+0.20*(mid-term test/s)+0.40*(final exam)
There is no re-assessment exam in this course.

EXAMINATION RULES.

It is mandatory to have completed all the laboratory sessions.
The student must bring ID or other identification on the day of the periodic controls and final exam.

BIBLIOGRAPHY

Basic:

- Floyd, Thomas L. Fundamentos de sistemas digitales [on line]. 11ª ed. Madrid: Pearson Educación, [2016] [Consultation: 22/04/2020]. Available on: http://www.ingebook.com/ib/NPcd/IB_BooksVis?cod_primaria=1000187&codigo_libro=6120. ISBN 9788490353011.
- Hayes, John P. Introducción al diseño lógico digital. Argentina: Addison-Wesley Iberoamericana, cop. 1996. ISBN 0201625903.
- Wakerly, John F. Diseño digital : principios y prácticas. México [etc.]: Pearson Educación, 2001. ISBN 9701704045.
- Money Harris, David; Harris, Sarah L. Digital design and computer architecture [on line]. Amsterdam: Elsevier, cop. 2013 [Consultation: 04/05/2020]. Available on: https://www.sciencedirect.com/science/book/9780123944245. ISBN 9780123944245.
- Ashenden, Peter J. The Designer's guide to VHDL [on line]. 3rd ed. Burlington: Morgan Kaufmann, 2008 [Consultation: 04/05/2020]. Available on: http://www.sciencedirect.com/science/book/9780120887859. ISBN 9780120887859.
- Hwang, Enoch O.. Digital logic and microprocessor design with VHDL. Toronto [etc.]: Thomson, cop. 2006. ISBN 9780534465933.
- Rushton, Andrew. VHDL for logic synthesis [on line]. 3rd ed. Chichester: Wiley & Sons, cop. 2011 [Consultation: 04/05/2020]. Available on: http://onlinelibrary.wiley.com/book/10.1002/9781119995852. ISBN 9781119995852.

Complementary:

- Stallings, William. Organización y arquitectura de computadores [on line]. 7ª ed. Madrid [etc.]: Pearson, cop. 2005 [Consultation: 29/04/2020]. Available on: http://www.ingebook.com/ib/NPcd/IB_BooksVis?cod_primaria=1000187&codigo_libro=1266. ISBN 9788483228586.
- Storey, Neil. Electrónica : de los sistemas a los componentes. Wilmington, Delaware: Addison-Wesley Iberoamericana, cop. 1995. ISBN 0201625725.
- Brown, Stephen D.; Vranesic, Zvonko G. Fundamentals of digital logic with VHDL design. 3rd ed. Boston [etc.]: McGraw-Hill, cop. 2009. ISBN 9780077221430.
- Chang, K. C. Digital systems design with VHDL and synthesis: an integrated approach. Los Alamitos (Calif.): IEEE Computer Society, cop. 1999. ISBN 0769500234.
- Institute of Electrical and Electronics Engineers. IEEE Standard VHDL language reference manual [on line]. New York: Institute of Electrical and Electronics Engineers, 2009 [Consultation: 20/05/2011]. Available on: http://ieeexplore.ieee.org/servlet/opac?punumber=4772738.
- Bhasker, Jayaram. A VHDL primer. 3a ed. Upper Saddle River, New Jersey: Prentice Hall, cop. 1999. ISBN 0130965758.