Course guides
820224 - ELDI - Digital Electronics

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: 2021 ECTS Credits: 6.0 Languages: Catalan

LECTURER

Coordinating lecturer: FÉLIX GUTIÉRREZ ESCRIBÀ - JORDI COSP VILELLA

Others:
- Primer quadrimestre:
  - MAZIAR AHMADI ZEIDABADI - M13, M14
  - JORDI COSP VILELLA - M11, M12, M13, M14, M21, M22, M23
  - FÉLIX GUTIÉRREZ ESCRIBÀ - M11, M12, M21, M22, M23

- Segon quadrimestre:
  - MAZIAR AHMADI ZEIDABADI - T11, T12, T13, T14
  - FÉLIX GUTIÉRREZ ESCRIBÀ - T11, T12, T13, T14

PRIOR SKILLS

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

REQUIREMENTS

SISTEMES ELECTRÒNICS - Prerequisite

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 methodology 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

<table>
<thead>
<tr>
<th>Type</th>
<th>Hours</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hours small group</td>
<td>15,0</td>
<td>10.00</td>
</tr>
<tr>
<td>Hours large group</td>
<td>45,0</td>
<td>30.00</td>
</tr>
<tr>
<td>Self study</td>
<td>90,0</td>
<td>60.00</td>
</tr>
</tbody>
</table>

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 Arithmetics

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

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**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-21.** Understand the fundamentals and applications of digital electronics and microprocessors.
- **CEEIA-24.** Design analogue, digital and power systems.
- **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

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**Algorithmic State Machines (ASM)**

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

**Related competencies:**
- **CEEIA-21.** Understand the fundamentals and applications of digital electronics and microprocessors.
- **CEEIA-24.** Design analogue, digital and power systems.
- **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-21. Understand the fundamentals and applications of digital electronics and microprocessors.
CEEIA-24. Design analogue, digital and power systems.

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

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

EXAMINATION RULES.

Is mandatory to have completed the lab exercises and bring ID or other identification on the day of the periodic controls and final exam.

BIBLIOGRAPHY

Basic:

Complementary: