Course guide
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: 2023 ECTS Credits: 6.0 Languages: Catalan

LECTURER

Coordinating lecturer: GÓMEZ FERNÁNDEZ, SERGIO

Others: Primer quadrimestre:
ROGER CATALÀ MEJIAS - Grup: M21, Grup: M22
PILAR FRANCISCA LUIS PEÑA - Grup: M11, Grup: M12, Grup: M13, Grup: M14, Grup: M24

Segon quadrimestre:
ROGER CATALÀ MEJIAS - Grup: T11, Grup: T13
SERGIO GÓMEZ FERNÁNDEZ - Grup: T11, Grup: T12, Grup: T13, Grup: 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 on 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>
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<tbody>
<tr>
<td>Hours small group</td>
<td>15.0</td>
<td>10.00</td>
</tr>
<tr>
<td>Self study</td>
<td>90.0</td>
<td>60.00</td>
</tr>
<tr>
<td>Hours large group</td>
<td>45.0</td>
<td>30.00</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 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**

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:**

**Complementary:**