820224 - ELDI - Digital Electronics

Coordinating unit: 295 - EEBE - Barcelona East School of Engineering
Teaching unit: 710 - EEL - Department of Electronic Engineering
Academic year: 2019
Degree: BACHELOR'S DEGREE IN INDUSTRIAL ELECTRONICS AND AUTOMATIC CONTROL ENGINEERING (Syllabus 2009). (Teaching unit Compulsory)
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ECTS credits: 6  Teaching languages: Catalan

Teaching staff
Coordinator: JORDI COSP VILELLA
Others: Primer quadrimestre:
  MAZIAR AHMADI ZEIDABADI - M13, M14
  JORDI COSP VILELLA - M11, M12, M13, M14, M21, M22, M23
  FÈLIX GUTIÉRREZ ESCRIBÁ - M11, M12, M21, M22, M23

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 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.
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## Study load

<table>
<thead>
<tr>
<th>Total learning time: 150h</th>
<th>Hours large group:</th>
<th>45h</th>
<th>30.00%</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Hours medium group:</td>
<td>0h</td>
<td>0.00%</td>
</tr>
<tr>
<td></td>
<td>Hours small group:</td>
<td>15h</td>
<td>10.00%</td>
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<tr>
<td></td>
<td>Guided activities:</td>
<td>0h</td>
<td>0.00%</td>
</tr>
<tr>
<td></td>
<td>Self study:</td>
<td>90h</td>
<td>60.00%</td>
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</tbody>
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<table>
<thead>
<tr>
<th>Content</th>
<th>Learning time</th>
<th>Theory classes</th>
<th>Laboratory classes</th>
<th>Self study</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction and review of previous concepts</td>
<td>7h 30m</td>
<td>3h</td>
<td>0h</td>
<td>4h 30m</td>
</tr>
<tr>
<td><strong>Description:</strong></td>
<td></td>
<td></td>
<td></td>
<td>Brief overview of the knowledge acquired in the course Electronic Systems</td>
</tr>
<tr>
<td>High Level Hardware Design Basics</td>
<td>11h 15m</td>
<td>1h 30m</td>
<td>3h</td>
<td>6h 45m</td>
</tr>
<tr>
<td><strong>Description:</strong></td>
<td></td>
<td></td>
<td></td>
<td>Introduction and basics of digital electronic system design using high-level descriptions and programmable logic devices.</td>
</tr>
<tr>
<td>Combinational blocks</td>
<td>16h 15m</td>
<td>4h 30m</td>
<td>2h</td>
<td>9h 45m</td>
</tr>
<tr>
<td><strong>Description:</strong></td>
<td></td>
<td></td>
<td></td>
<td>Description, operation and use of common combinational blocks.</td>
</tr>
<tr>
<td>Sequential blocks</td>
<td>16h 15m</td>
<td>4h 30m</td>
<td>2h</td>
<td>9h 45m</td>
</tr>
<tr>
<td><strong>Description:</strong></td>
<td></td>
<td></td>
<td></td>
<td>Description, operation and use of basic common sequential blocks.</td>
</tr>
</tbody>
</table>
### Sequential Systems

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

**Learning 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

**Learning 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.

**Learning 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.

**Learning 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.

**Learning time:** 15h
- Theory classes: 6h
- Self study: 9h
# Qualification 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.

## Regulations for carrying out activities

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

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## Memories and Programmable Logic Devices

<table>
<thead>
<tr>
<th>Learning time: 12h 30m</th>
</tr>
</thead>
<tbody>
<tr>
<td>Theory classes: 3h</td>
</tr>
<tr>
<td>Laboratory classes: 2h</td>
</tr>
<tr>
<td>Self study : 7h 30m</td>
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</tbody>
</table>

**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).

## The Microprocessor

<table>
<thead>
<tr>
<th>Learning time: 15h</th>
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</thead>
<tbody>
<tr>
<td>Theory classes: 6h</td>
</tr>
<tr>
<td>Self study : 9h</td>
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**Description:**
Introduction to the microprocessor system and its internal architecture.
Bibliography

Basic:


Complementary:


