270645 - NCD - Nanoelectronic Circuit Design

Coordinating unit: 270 - FIB - Barcelona School of Informatics
Teaching unit: 701 - DAC - Department of Computer Architecture
Academic year: 2019
Degree: MASTER'S DEGREE IN INNOVATION AND RESEARCH IN INFORMATICS (Syllabus 2012). (Teaching unit Optional)
ECTS credits: 6
Teaching languages: English

Degree competences to which the subject contributes

Basic:
CB7. Ability to integrate knowledges and handle the complexity of making judgments based on information which, being incomplete or limited, includes considerations on social and ethical responsibilities linked to the application of their knowledge and judgments.

Specific:
CEE4.1. Capability to analyze, evaluate and design computers and to propose new techniques for improvement in its architecture.

General:
CG3. Capacity for mathematical modeling, calculation and experimental designing in technology and companies engineering centers, particularly in research and innovation in all areas of Computer Science.

Transversal:
CTR2. SUSTAINABILITY AND SOCIAL COMMITMENT: Capability to know and understand the complexity of the typical economic and social phenomena of the welfare society. Capacity for being able to analyze and assess the social and environmental impact.

Teaching methodology

The main concepts of processor architecture will be introduced in the lectures. The students will complete their learning experience with the lab sessions where they will put in practice the concepts learned in the lectures.

Learning objectives of the subject

Study load

<table>
<thead>
<tr>
<th>Total learning time: 150h</th>
<th>Hours large group: 27h</th>
<th>18.00%</th>
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</thead>
<tbody>
<tr>
<td>Hours medium group: 13h 30m</td>
<td>9.00%</td>
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<tr>
<td>Hours small group: 13h 30m</td>
<td>9.00%</td>
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<tr>
<td>Guided activities: 0h</td>
<td>0.00%</td>
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<tr>
<td>Self study: 96h</td>
<td>64.00%</td>
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# Content

## Introduction to MOS and VLSI Technology

**Degree competences to which the content contributes:**

**Description:**
Introduction to the technology used to build integrated circuits, historical perspective and future projections

## CMOS Design

**Degree competences to which the content contributes:**

**Description:**
Fundamentals of VLSI MOS-based designs. Logic gates, logic styles and basic blocks.

## VLSI Design Cycle

**Degree competences to which the content contributes:**

**Description:**
Presentation of the VLSI Design Stages, presentation of tools and workflow.

## Thermal and Energy Analysis of Microprocessors

**Degree competences to which the content contributes:**

**Description:**
Methods and tools for thermal and energy Analysis of Microprocessors including memory, interconnect and system level modelling.

## Design Implications of Temperature and Power

**Degree competences to which the content contributes:**

**Description:**
Presentation of the design implications of temperature and power, presentation of the most relevant compile-time and run-time techniques to control temperature and power.

## Design for Reliability

**Degree competences to which the content contributes:**

**Description:**
Introduction to process, voltage and temperature variations, inter-die and intra-die variations. Transient errors and permanent faults.
Technology outlook

Degree competences to which the content contributes:

Description:
Introduction to future emerging technologies: late-cmos and post-cmos technologies

Qualification system

The course has two marks:
1) Essay/presentation (E)
2) The lab sessions (Lab)

The final mark will be computed as: 0,4 x Lab + 0,6 x E

Bibliography

Basic:
