270616 - AVLSI - Algorithms for VLSI

Coordinating unit: 270 - FIB - Barcelona School of Informatics
Teaching unit: 723 - CS - Department of Computer Science
Academic year: 2019
Degree: MASTER'S DEGREE IN INNOVATION AND RESEARCH IN INFORMATICS (Syllabus 2012). (Teaching unit Optional)
ECTS credits: 6
Teaching languages: English

Teaching methodology

The theoretical content of the course is taught in the theory lectures. During the practical classes, practical examples are solved and different types of problems are proposed. These problems will have to be solved during the time of autonomous learning. An algorithmic project will also be proposed during the course. Students will have to solve and implement it during their time of autonomous learning.

Learning objectives of the subject

Study load

<table>
<thead>
<tr>
<th>Total learning time: 150h</th>
<th>Hours large group: 24h 16.00%</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Hours medium group: 12h 8.00%</td>
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<tr>
<td></td>
<td>Hours small group: 12h 8.00%</td>
</tr>
<tr>
<td></td>
<td>Guided activities: 6h 4.00%</td>
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<tr>
<td></td>
<td>Self study: 96h 64.00%</td>
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</tbody>
</table>
## Content

### Introduction.

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

**Description:**
Integrated circuit fabrication. Layout layers and design rules. VLSI design flow. VLSI design styles.

### Two-level logic synthesis

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

**Description:**


### Multi-level logic synthesis.

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

**Description:**

Kernel-based algebraic decomposition. AIG-based decomposition. Technology mapping for standard cells and FPGAs.

### Formal verification

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

**Description:**


### Partitioning and Floorplanning

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

**Description:**


### Placement

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

**Description:**
### Global routing

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

**Description:**

### Detailed routing

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

**Description:**
Horizontal and vertical constraint graphs. Channel routing, Switchbox routing, Over-the-cell routing.
# Planning of activities

<table>
<thead>
<tr>
<th>Topic</th>
<th>Hours</th>
<th>Theory classes</th>
<th>Practical classes</th>
<th>Laboratory classes</th>
<th>Guided activities</th>
<th>Self study</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Learning the design flow of a VLSI circuit</strong></td>
<td>4h</td>
<td>2h</td>
<td>0h</td>
<td>0h</td>
<td>0h</td>
<td>2h</td>
</tr>
<tr>
<td><strong>Learning of algorithms for logic synthesis</strong></td>
<td>34h</td>
<td>10h</td>
<td>4h</td>
<td>0h</td>
<td>0h</td>
<td>20h</td>
</tr>
<tr>
<td><strong>Learning of techniques for formal verification of circuits</strong></td>
<td>24h</td>
<td>6h</td>
<td>4h</td>
<td>0h</td>
<td>0h</td>
<td>14h</td>
</tr>
<tr>
<td><strong>Learning of techniques for circuit floorplanning and placement</strong></td>
<td>32h</td>
<td>8h</td>
<td>4h</td>
<td>0h</td>
<td>0h</td>
<td>20h</td>
</tr>
<tr>
<td><strong>Learning of routing algorithms</strong></td>
<td>32h</td>
<td>10h</td>
<td>6h</td>
<td>0h</td>
<td>0h</td>
<td>16h</td>
</tr>
</tbody>
</table>
Qualification system

Grade = 40% FW + 30% FT + 20% EX + 10% SP

FW = Final Work (graded from 0 to 10) in which each participant is required to present a research paper or section of a book (previously assigned by the lecturer). The presentation consists of:
* 3-5 minutes background on the topic of the paper, a motivation.
* 1 minute overview of the key ideas of the paper.
* 15 minutes presentation with most important details.
* 5 minutes demo of a program that implements the ideas introduced in the paper.

FT = Final test graded from (0 to 10) including all the contents of the course.

EX = Exercises assigned to the student and solved during the Autonomous Learning time

SP = Summaries and participation (graded from 0 to 10) in which each participant is required to deliver a summary (1 page extent) of each other's presentation and to participate (with questions and comments).

Bibliography

Basic:

