

CS-472

**Design technologies for integrated systems**

De Micheli Giovanni

Cursus	Sem.	Type
Computer and Communication Sciences		Opt.
Computer science	MA1, MA3	Opt.
Cybersecurity	MA1, MA3	Opt.
Electrical and Electronical Engineering	MA1, MA3	Opt.
MNIS	MA3	Obl.
Neuro-X minor	H	Opt.
Neuro-X	MA1, MA3	Opt.
SC master EPFL	MA1, MA3	Opt.

Contact language	English
Credits	6
Session	Winter
Semester	Fall
Exam	During the semester
Workload	180h
Weeks	14
<b>Hours</b>	<b>5 weekly</b>
Lecture	3 weekly
Project	2 weekly
<b>Number of positions</b>	

**Summary**

Hardware compilation is the process of transforming specialized hardware description languages into circuit descriptions, which are iteratively refined, detailed and optimized. The course presents algorithms, tools and methods for hardware compilation and logic synthesis.

**Content**

The course will present the most outstanding features of hardware compilation, as well as the techniques for optimizing logic representations and networks. The course gives a novel, up-to-date view of digital circuit design. Practical sessions will teach students the use of current design tools. Syllabus: 1) Modeling languages and specification formalisms; 2) High-level synthesis and optimization methods (scheduling, binding, data-path and control synthesis); 3) Representation and optimization of combinational logic functions (encoding problems, binary decision diagrams); 4) Representation and optimization of multiple-level networks (algebraic and Boolean methods, "don't care" set computation, timing verification and optimization); 5) Modeling and optimization of sequential functions and networks (retiming); 6) Semicustom libraries and library binding.

**Keywords**

Hardware, VLSI, Synthesis, Optimization, Algorithms

**Learning Prerequisites****Required courses**

No specific course

**Recommended courses**

Good knowledge of digital design, algorithm design and programming.

**Important concepts to start the course**

Good knowledge of digital design, algorithm design and programming.

**Learning Outcomes**

By the end of the course, the student must be able to:

- Recognize important problems in digital design
- Examine and evaluate available design tools and methods
- Decide upon a design tool flow to perform a digital design

### **Transversal skills**

- Plan and carry out activities in a way which makes optimal use of available time and other resources.

### **Assessment methods**

Continuous control :

Homework : 30 %, Project 10 %, Midterm test : 25 %,

End term test : 35 %

### **Resources**

#### **Bibliography**

G. De Micheli, Synthesis and Optimization of Digital Circuits, McGraw'Hill.

#### **Ressources en bibliothèque**

- [Synthesis and Optimization of Digital Circuits / De Micheli](#)

#### **Notes/Handbook**

Copies of the slides used for lectures will be given in class and posted.

#### **Moodle Link**

- <https://go.epfl.ch/CS-472>