lelec2570
2018

Synthesis of digital integrated circuits

5 credits	30.0 h + 30.0 h	Q1

Teacher(s)	Bol David ;
Language :	English
Place of the course	Louvain-la-Neuve
Prerequisites	• The basic formation in digital electronic circuits is compulsory: LELEC2531 at UCL. • A course in embedded system design is an advantage: LINGI2315 at UCL. *The prerequisite(s) for this Teaching Unit (Unité d'enseignement – UE) for the programmes/courses that offer this Teaching Unit are specified at the end of this sheet.*
Main themes	The exponential increase in computing performances of digital integrated circuits (ICs) fundamentally modified our everyday's life in numerous domains (consumer, business, medical, industrial). Nowadays these circuits feature several millions of transistors, which results a high design complexity.
Aims	With respect to the AA referring system defined for the Master in Electrical Engineering, the course contributes to the development, mastery and assessment of the following skills : • AA1.1AA1.2 • AA2.1, AA2.2, AA2.3, AA2.4, AA2.5 • AA3.1 • AA5.5 1 b. **After this course, the electrical engineers in circuit and systems should be able to:** • produce the layout of a digital IC in a modern CMOS technology starting from a behavioral description and using industrial-level EDA tools, • discuss the trade-offs linked to the synthesis of digital ICs between silicon area, computing performance, power consumption, flexibility and robustness, • setup a strategy for verifying the obtained results using HDL simulations, • rapidly evaluate the efficiency of high-level architectural solutions and HW/SW optimizations, • communicate clearly and efficiently technical results in a circuit design report. - - - - *The contribution of this Teaching Unit to the development and command of the skills and learning outcomes of the programme(s) can be accessed at the end of this sheet, in the section entitled "Programmes/courses offering this Teaching Unit".*
Evaluation methods	The individual evaluation is based on • short weekly assignments during the semester, • a written exam.
Teaching methods	The course is organized as follows. • Lectures introducing the various digital IC concepts, illustrated by recent digital IC examples from both the industrial and research worlds. • Seminars given by experts from the industrial world regarding the design of digital ICs. • A central individual project on the full design of an industry-relevant digital SoC with weekly milestones linked to the steps of the design flow. This self-learning project is based on industrial CAD tools. • The interaction between the students, the teachers and assistants will be encouraged by the use of a discussion forum on Moodle platform and interactive project debriefing sessions during the lectures.
Content	• Microcontroller-based embedded systems • High-level design and verification of digital SoCs • Robust HDL coding in Verilog • Logic synthesis of digital circuits • Clocking and timing closure • Digital standard cell libraries and hard macros • Place and route of digital circuits • CMOS technology scaling • DSP architecture, arithmetic circuits and hardware accelerators
Inline resources	Moodle http://moodleucl.uclouvain.be/enrol/index.php?id=3

Bibliography	• Transparents des cours, chapitres de certains livres de référence, disponibles sur Moodle Chapitres de certains livres de référence.
Other infos	A course in embedded system design is an advantage: LINGI2315.
Faculty or entity in charge	ELEC

Programmes containing this learning unit (UE)

Program title	Acronym	Credits	Prerequisite	Aims
Master [120] in Electro-mechanical Engineering	ELME2M	5		🔍
Master [120] in Electrical Engineering	ELEC2M	5	LELEC2531	🔍