UCLouvain

lelec2620

2020

Modeling and implementation of analog and mixed analog/digital circuits and systems on chip

Due to the COVID-19 crisis, the information below is subject to change, in particular that concerning the teaching mode (presential, distance or in a comodal or hybrid format).

5 credits	30.0 h + 30.0 h	Q2

Teacher(s)	Bol David ;
Language :	English
Place of the course	Louvain-la-Neuve
Main themes	Over the last decades, integrated circuits have evolved from chips with a single function to complex systems on a single silicon chip. Such modern systems-on-chip (SoCs) features digital signal processors, microcontrollers, analog and RF circuits to provide the necessary interfaces to the physical world made of sensor signals, audio/video interfaces, electronic signals or wireless communications. These analog/mixed-signal (AMS) systems require the co-integration, co-design and co-verification of analog and digital circuits on the same CMOS technology platform. In this course, we will study the implementation of mixed analog/digital circuits with the help of behavioral modeling, as an essential tool within the design flow of AMS systems. This course concludes the ELEC formation in electronic circuits and systems.
Aims	a. Contribution of the activity to the learning outcomes of the program AA1 Knowledge base : electronic concepts (AA1.1), simulation and CAD tools (AA1.2) AA2 Engineering skills : analysis and modeling of an electronic system, AA3 R&D skills : find appropriate references on the existing solutions in the field of the course's project (AA3.1) AA4 Project management AA5 Communication skills : analysis and writing of a technical datasheet (AA5.3-5.5). b. Learning outcomes **After this course, the electrical engineers in circuit and systems should be able to:** 1 • critically compare analog and digital circuit solutions within a given applicative system context with respect to signal quality, power consumption, cost and flexibility, • analyze the sources and propagation of analog non-idealities into a mixed-signal chain, • generate appropriate abstractions for analog building blocks and model their behavior at high level in Verilog-AMS language, • setup an appropriate methodology for designing, simulating and verifying a mixed-signal system from specification phase to block partitioning to physical implementation, • co-simulate and co-verify analog blocks with a digital circuit in Verilog to mitigate the limitations of analog blocks and to extract specifications for the mixed-signal circuit implementation, • analyze industrial-level datasheets of an electronic system in the context of a design project , • analyze scientific-level papers in the field of electronic circuit and systems. - - - - *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	**Due to the COVID-19 crisis, the information in this section is particularly likely to change.** The evaluation is based on several assignments in groups during the semester and an individual written or oral exam during the session.
Teaching methods	**Due to the COVID-19 crisis, the information in this section is particularly likely to change.** The course is organized as follows. • lectures on the key AMS concepts, • assignment in groups and/or individual for active learning with in-class kick-off and debriefing sessions
Content	• AMS system design methodologies • Behavorial analog modeling • Analog non idealities and auto-compensation • Digital assistance of analog circuits • Modeling and implementation of phase-locked loops

	• Modeling and implementation of systems based on sigma-delta modulation (if time allows)
Inline resources	http://moodleucl.uclouvain.be/enrol/index.php?id=2373
Bibliography	Chapitres de certains livres de référence.
Faculty or entity in charge	ELEC

Programmes containing this learning unit (UE)				
Program title	Acronym	Credits	Prerequisite	Aims
Master [120] in Electrical Engineering	ELEC2M	5		
Master [120] in Electro-mechanical Engineering	ELME2M	5		