UCLouvain

lelec2532

2019

Design and Architecture of analog electronic systems

In view of the health context linked to the spread of the coronavirus, the methods of organisation and evaluation of the learning units could be adapted in different situations; these possible new methods have been - or will be - communicated by the teachers to the students.

5 credits	30.0 h + 30.0 h	Q2

Teacher(s)	Bol David ;Flandre Denis ;
Language :	English
Place of the course	Louvain-la-Neuve
Main themes	The world we live in is getting more and digital with electronic embedded systems surrounding us and communicating with the cloud. However, the physical world is analog in essence. The digital embedded systems thus need analog functions to interact with the physical world, its users, the cloud, the energy sources, as well as between themselves. This is done through sensors, actuators, user interfaces, power management units, wireline and wireless communications. Digital systems also rely on key analog functions performed internally for efficient operation: memories, clocking and voltage regulation. In this course, we study the architecture of the key analog electronic systems performing these functions. Within the ELEC/ELME formation, this course presents analog system architectures as a complementary to ELEC2531 course on digital system architectures. It serves as a basis for the courses on integrated-circuit synthesis (ELEC2650, ELEC2570 and ELEC2620).
Aims	a. Contribution of the activity to the learning outcomes of the program • AA1 Knowledge base : electronic concepts (AA1.1), simulation and CAD tools (AA1.2-3). • AA2 Engineering skills: problem analysis (AA2.1) and solution comparison (AA2.3). • AA3 R&D skills : find appropriate references on the existing solutions in the field of the flipped class topic (AA3.1). • AA5 Communication skills: oral communication (AA5.3, AA5.6). • AA6 Professional skills: use of appropriate standards (AA6.1), critical evaluation of technical solutions (AA6.3) and autonomous learning (AA6.4). 1 b. Learning outcomes **After this course, the electrical engineers in circuit and systems should be able to:** • identify the key performance metrics of an analog function in a given application context, • explain the operation of typical analog system architectures, • qualitatively model the performance with respect to the architecture, • evaluate the performance of typical analog system architectures with SPICE simulations. - - - - *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 the group challenges during the semester, an individual written exam and an invidual practical exam with the simulation tool.
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 generic analog concepts and building blocks, • exercise sessions on these concepts and building blocks, • flipped classes about typical analog applications and associated specific architectures of analog systems, these classes are based on a reading at home and a group challenge in class with a SPICE simulation tool, • seminar given by an expert from the industry (if time allows).
Content	• Noise in analog circuits • Opamp-based circuits • Analog filters • Voltage and current references • Voltage regulators • Memories (it time allows) • CMOS imagers

	• Oscillators • Phase-locked loops • High-speed serial I/Os
Inline resources	http://moodleucl.uclouvain.be/enrol/index.php?id=934
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 Biomedical Engineering	GBIO2M	5		
Master [120] in Electro-mechanical Engineering	ELME2M	5		
Master [120] in Electrical Engineering	ELEC2M	5		