UCLouvain

lelec2895

2017

Design of micro and nanosystems

5 credits	30.0 h + 30.0 h	Q1

Teacher(s)	Flandre Denis ;Francis Laurent coordinator ;Pardoen Thomas ;Raskin Jean-Pierre ;
Language :	English
Place of the course	Louvain-la-Neuve
Main themes	This cursus is part of the MEMS & NEMS, Micro and Nanotechnology ELEC options. LELEC2895 is focused on the understanding and the design of micro-electromechanical devices (MEMS), on transducers (sensors, actuators) made using micro and nanofabrication technologies, to their co-integration with integrated circuits (IC), to their multiphysics simulation and characterisation, to their reliability and their interconnect.
Aims	With respect to the AA referring system defined for the Master in Electrical Engineering, the course contributes to the develoopment, mastery and assessment of the following skills : • AA1.1, AA1.2, AA1.3 • AA2.1, AA2.2, AA2.3, AA2.4, AA2.5 • AA3.1, AA3.2, AA3.3 • AA4.2, AA4.3, AA4.4 • AA5.1, AA5.2, AA5.3, AA5.4, AA5.5, AA5.6 • AA6.1, AA6.3, AA6.4 1 **After this course, the student will be able to:** • Describe the transduction principles and scaling effects • Understand specifications for a MEMS • Design MEMS and NEMS and use multiphysics simulation softwares and tools • Identify electronic circuits adapted to MEMS and NEMS • Identify fabrication techniques required to make such devices • Analyse the reliability of miniaturised devices • Present (report) and defend (slides) the results of a group project (with 2 to 4 students) - - - - *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 project evaluation is based on the style and content of a written report and an oral presentation made by group. The exam is an open book format.
Teaching methods	The course is organised as following • 8 sessions of theoretical lectures • 3 sessions of exercices • 2 tutorial sessions to become acquainted with the software required for the project
Content	1. MEMS design methodology 2. Scale effects and transduction principles 3. Sensors and actuators: electrical, mechanical, thermal, optical, (bio)chemical, etc... 4. Fabrication processes 5. MEMS and CMOS technology circuits co-integration 6. Interconnections and packaging 7. Multiphysics simulations and characterizations
Inline resources	Moodle http://moodleucl.uclouvain.be/course/view.php?id=7527
Bibliography	Supports • Transparents disponibles sur Moodle • Livre de référence disponible à la BST (Ville Kaajakari, "Practical MEMS", Small Gear Publishing)
Other infos	LELEC2560 Micro and Nanofabrication Techniques is a desirable prerequisite. Basic knowledge of electronics, solid-state physics, materials science and chemistry is an advantage.

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		
Master [120] in Chemical and Materials Engineering	KIMA2M	5		
Master [120] in Physical Engineering	FYAP2M	5		