



This learning unit is not being organized during this academic year.

Teacher(s)	Francis Laurent ;
Language :	English > French-friendly
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.
Learning outcomes	At the end of this learning unit, the student is able to : With respect to the AA referring system defined for the Master in Electrical Engineering, the course contributes to the developpement, 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 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).
Evaluation methods	The course is subject to continuous evaluation for 3/5 of the final grade during the semester when submitting group work reports on the practical work sessions, and for 2/5 by an individual oral examination in session, unless the mark of the individual oral examination is less than 10/20 in which case the final mark will be that of the individual oral examination only. The in-session exam is an open book exam assisted by a written preparation. The group work note is kept for all sessions of the same academic year.
Teaching methods	The course is organised as following • 10 sessions of theoretical lectures, based on flipped classes helped by the resolution in students group of numerous examples and cases • 1 tutorial session related to the software tools • 3 sessions of design practical works, with teaching support • 1 industrial seminar
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. Selection of electronic interface circuits 6. Multiphysics simulations
Inline resources	Moodle http://moodleucl.uclouvain.be/course/view.php?id=7527
Bibliography	<u>Supports</u> • Transparents disponibles sur Moodle/Slides available on Moodle • Livre de référence disponible à la Bibliothèque des Sciences et Technologies/Reference book available at the Science and Technology Library (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	Learning outcomes
Master [120] in Chemical and Materials Engineering	KIMA2M	5		
Master [120] in Electrical Engineering	ELEC2M	5		
Master [120] in Physical Engineering	FYAP2M	5		
Advanced Master in Nanotechnologies	NANO2MC	5		