UCLouvain

lelec2895

2020

Design of micro and nanosystems

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	Q1

Teacher(s)	Francis Laurent ;
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	**Due to the COVID-19 crisis, the information in this section is particularly likely to change.** The course is subject to continuous evaluation for 2/3 of the final grade during the semester when submitting group work reports on the practical work sessions, and for 1/3 by an individual oral examination in session. The in-session exam is a closed book exam but is assisted by the course form. The distribution of marks may be waived in the event of a noticeable difference in performance between the written work and the final oral performance, in which case only the latter's mark will be considered.
Teaching methods	**Due to the COVID-19 crisis, the information in this section is particularly likely to change.** 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	Supports • 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

Force majeure

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 The sessions will be held online.
Evaluation methods	The course is subject to continuous evaluation for 2/3 of the final grade during the semester when submitting group work reports on the practical work sessions, and for 1/3 by an individual oral examination in session. The in-session exam is an open book oral exam held online. To prepare the in-session exam, each student will be given one week ahead the planned exam date an exercise to prepare individually and to submit back before the exam. This preparation will support partly the discussions during the oral exam. The distribution of marks may be waived in the event of a noticeable difference in performance between the written work and the final oral performance, in which case only the latter's mark will be considered.

Programmes containing this learning unit (UE)				
Program title	Acronym	Credits	Prerequisite	Aims
Master [120] in Physical Engineering	FYAP2M	5		
Master [120] in Electrical Engineering	ELEC2M	5		
Master [120] in Chemical and Materials Engineering	KIMA2M	5		
Advanced Master in Nanotechnologies	NANO2MC	5		