UCLouvain

lelec2541

2019

Advanced Transistors

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)	Flandre Denis (coordinator) ;Hackens Benoît ;Raskin Jean-Pierre ;
Language :	English
Place of the course	Louvain-la-Neuve
Main themes	This training on advanced semiconductor devices follows naturally that of LELEC1330. It is focused on high performance devices in terms of speed, noise and temperature. The course highlights the links between physical phenomena, materials, fabrication and performances. Simulation and characterisation tools will be introduced. Content : Special semiconductors (heterostructures, SOI, III-V), HEMT, JFET, MESFET, Diodes, bipolar transistors, and small scale and high frequency MOS devices.
Aims	In consideration of the reference table AA of the program "master in electrical engineering ", this course contributes to the development, to the acquisition and to the evaluation of the following experiences of learning: • AA1.1, AA1.2, AA1.3 • AA2.1, AA2.2, AA2.5 • AA3.1, AA3.2, AA3.3 • AA4.1, AA4.2, 4.3, AA4.4 1 • AA5.3, AA5.4, AA5.5, AA5.6, • AA6.1 At the end of this course,students will be able to - Describe the physical behavior at play, and use appropriate models, in advanced semiconductor devices and in a wide range of temperature and frequency. - Use simulation and accurate characterization tools of semiconductor devices. - Model new devices in the perspective of forthcoming courses and master projects. - - - - *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.** Written exam on the theoretical background (50%) Report and oral presentation of a personal/group project (50%)
Teaching methods	**Due to the COVID-19 crisis, the information in this section is particularly likely to change.** • 11 lectures • 2 laboratories • 1 individual project, or in small groups.
Content	Lectures are given interactively and are based on the themes presented above. They are complementary to the written notes and references below as they give a different perspective and are based on student questions. The project is an extension of the lectures and allows a deeper understanding of advanced devices. It relies on a bibliographic review of a specific subject chosen by the students (groups of 1 to 3), and/or the analysis of experimental data and modelling, depending on ressources available in the lab.
Inline resources	https://moodleucl.uclouvain.be/course/search.php?search=LELEC2541

Bibliography	Slides et autres supports proposés par les enseignants sur Moodle. Références disponibles en bibliothèques : - « Physics of low-dimensional semiconconductors », J.H. Davies, Cambridge University Press - « Physique des dispositifs semi-conducteurs », De Boeck Université, J.-P. Colinge et F. Van de Wiele - « Silicon-on-Insulator Technology: Materials to VLSI », 2nd Edition, J.-P. Colinge, Kluwer Academic Publishers - « Operation and modeling of the MOS transistor», Y. P. Tsividis, McGraw-Hill Book Company. - « Quantum semiconductor Structures », C. Weisbuch and B. Vinter, Academic Press Inc.
Other infos	Background in physics, including quantum mechanics, physics of semiconductor devices (e.g. LELEC1330)
Faculty or entity in charge	ELEC

Programmes containing this learning unit (UE)

Program title	Acronym	Credits	Prerequisite	Aims
Master [120] in Physical Engineering	FYAP2M	5		
Master [120] in Electro-mechanical Engineering	ELME2M	5		
Master [120] in Electrical Engineering	ELEC2M	5		
Master [120] in Chemical and Materials Engineering	KIMA2M	5		