UCL Université catholique de Louvain

LELEC2541

2014-2015

Advanced Transistors

5.0 credits	30.0 h + 30.0 h	2q

Teacher(s) :	Bayot Vincent (coordinator) ; Raskin Jean-Pierre ; Flandre Denis ;
Language :	Anglais
Place of the course	Louvain-la-Neuve
Inline resources:	> http://icampus.uclouvain.be/claroline/course/index.php?cid=LELEC2541
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 :	Regarding the learning outcomes of the program of "Master in Electrical Engineering", this course contributes to the development and the acquisition of the following learning outcomes : - AA1.1, 1.2, 1.3, - AA2.1, 2.2, 2.5, - AA3.1, 3.2, 3.3, -AA4.1, 4.2, 4.3, 4.4, - AA5.3, 5.4, 5.5, 5.6, - 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 :	Written exam on the theoretical background (50%) Report and oral presentation of a personal/group project (50%)
Teaching methods :	-- 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.
Bibliography :	Written notes. (iCampus) References: - « 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)
Cycle and year of study :	> Master [120] in Electrical Engineering > Master [120] in Physical Engineering > Master [120] in Chemical and Materials Engineering
Faculty or entity in charge:	ELEC