



Faculté des sciences appliquées

FSA

ELEC2541 ADVANCED ELECTRONIC DEVICES

[30h+30h exercises] 5 credits

This course is taught in the 1st semester

Teacher(s): Vincent Bayot (coord.), Denis Flandre, Jean-Pierre Raskin
Language: french
Level: 2nd cycle course

Aims

At the end of the course, the students will be able to

- understand the physical behavior and the models of advanced electronic devices (semiconductors) of the new generation, in a large range of temperatures and frequencies;
- use numerical simulation softwares and characterization techniques for comparing various novel semiconductor devices;
- go from theoretical concepts to the analysis and modeling of advanced devices or the integration of these in microwave circuits in the framework of other specific courses or of their master thesis.

Content and teaching methods

This course is following up the course ELEC2330 "Electrical Physics". The objective is the study of advanced devices recently proposed in the scientific literature and more particularly, their performance in terms of commutation speed, frequency behavior, noise, temperature, etc. The leading idea is to highlight the link between physical phenomena, semiconductor materials, fabrication technologies and device properties. The numerical simulation tools as well as the measurement technique will be introduced.

The main topics taught will be

- special semiconductors (heterostructures, SOI, III-V, etc...)
- High Mobility Transistor (HEMT), Junction Field Effect Transistor (JFET), Metal Semiconductor Field Effect Transistor (MESFET)
- diodes, bipolar transistors and MOS in nanoscale regime and at high frequencies

Other information (prerequisite, evaluation (assessment methods), course materials recommended readings, ...)

Prerequisites :

Basic formation in quantum electronics;

Physical electronics and solid-state physics

Teaching method :

14 lectures, 3 experimental studies in laboratories, 1 project in small groups (2 to 3 students)

Could be given in English

Other credits in programs

ELEC22	Deuxième année du programme conduisant au grade d'ingénieur civil électricien	(5 credits)
ELME23/M	Troisième année du programme conduisant au grade d'ingénieur civil électro-mécanicien (mécatronique)	(5 credits)