ELEC2710 NANOELECTRONICS

[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: Second cycle

Aims

At the end of the course, the students will be able to :
- explain the physical background of nanoelectronics, i.e. the specific quantum effects that show up in nanoscale electron devices,
- predict of analyze the behavior of nanoscale devices based on the concepts presented in the lectures

Main themes

Identical to the contents of the course

Content and teaching methods

Content :
The course introduces new physical concepts related to the confinements of electrons in nanoscale devices. It also describes the behavior of devices exhibiting quantum effects. The chapters are the following : review of quantum mechanics and solid state physics, density of states in low-dimensional systems, crossover between dimensionalities, heterostructures, quantum wells, quantum wires and quantum dots, quantum point contact, tunneling transport, resonant tunneling diode, sigle-electron transistor, quantum Hall effect.
Teaching method :
Lectures and exercices are given in an interactive way by emphasizing links with physical concepts. Problem based teaching. When possible, lab activities related to research in the laboratory are proposed.

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

Prerequisites :
Basic knowledge in quantum mechanics and solid-state physics
Assessment :
Written evaluation
Could be given in English

Other credits in programs

ELEC22	Deuxième année du programme conduisant au grade d'ingénieur civil électricien	(5 credits)
ELEC23	Troisième année du programme conduisant au grade d'ingénieur civil électricien	(5 credits)
MAP22	Deuxième année du programme conduisant au grade d'ingénieur civil en mathématiques appliquées	(5 credits)
MATR22	Deuxième année du programme conduisant au grade d'ingénieur civil en science des matériaux	(5 credits)
MATR23	Troisième année du programme conduisant au grade d'ingénieur civil en science des matériaux	(5 credits)