



PHYSIQUE DES SEMICONDUCTEURS ET DES DIÉLECTRIQUES

DIELECTRIC AND SEMICONDUCTOR PHYSICS

Lecturers: Christelle MONAT

| Lecturers : 13 | TC : 16.0 | PW : 0.0 | Autonomy : 13 | Study : 6 | Project : 0.0 | Language : FR

Objectives

Semiconductor materials are part of our modern life and sustain our technologies for computers, communications, lightning or energy conversion. After a presentation of the main physics processes in semiconductors and the resulting electronic and optical properties of these materials, the course will describe various device applications of semiconductors in microelectronics and optoelectronics.

Keywords : Semiconductors, dielectric materials, devices, microelectronics, optoelectronics

Programme

- 1/ Cristalline properties and fabrication of semiconductor materials
- 2/ Electronic band structures in semiconductors
- 3/ Electrical conduction of semiconductors
- 4/ Charge transport mechanisms in semiconductors
- 5/ PN junctions and applications
- 6/ Metal/ semiconductor junctions and applications
- 7/ Optoelectronic devices for light detection
- 8/ Optoelectronic devices for light emission

Learning outcomes

- Being able to explain the distinction between the properties of metals, insulators, and semiconductors and the origin of these differences
- Being able to use the concepts that describe the properties of semiconductor materials
- Being able to describe the processes responsible for electron transport and photon/ electron interactions in semiconductors
- Being able to describe how various classes of semiconductor devices work (transistors, photodiode, solar cells, laser diode)

Independent study

Objectifs : Group assignment to learn more about a particular topic in link with semiconductor physics and its applications in microelectronics/ optoelectronics

Méthodes : Various topics will be suggested (photovoltaics, blue LEDs, graphene and 2D materials, silicon photonics...)
Oral presentations will be prepared by each group and delivered at the final BE

Core texts

Henry Mathieu, *PHYSIQUE DES SEMICONDUCTEURS ET DES COMPOSANTS ÉLECTRONIQUES*, 5ème édition, Dunod,, 2009
Emmanuel ROSENCHER *OPTOÉLECTRONIQUE*, Masson, 1998

Assessment

Final mark = 80% Knowledge + 20% Know-how
Knowledge = 100% final exam
Know-how = 100% final exam