



NANOTECHNOLOGIES

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Lecturers: **Magali PHANER GOUTORBE**

| Lecturers : 16.0 | TC : 0.0 | PW : 4.0 | Autonomy : 0.0 | Study : 8.0 | Project : 0.0 | Language : FR

Objectives

Nanosciences and nanotechnologies deal with the understanding of the specific properties of structures at the nanoscale, as well as the development and characterization of these nanostructures. Nanotechnologies make it possible to push back the limits of miniaturization and generate new applications and new functionalities in microelectronics, photonics, materials science, biology with applications in medicine, energy and environmental issue.

This course presents the specific properties of nanostructures and nanomaterials, as well as the observation and development tools at the nanometric scale.

Keywords : Physics of low dimensional systems, Electron and Near field Microscopies, Nanolithography, Nanomaterials, Nanoelectronics and Nanophotonics, Nanobiotechnologies, Nanotechnology for energy and for the environmental issues.

Programme

Introduction to nanosciences and nanotechnologies.
Applications of nanotechnologies in everyday and tomorrow's objects (smartphone, nanorobot, medical nanocapsule, for energy and the environment ...)
Techniques of observation and characterization of nanostructures.
Nanolithography manufacturing processes.
Nanomaterials, nanowires and nanoparticles.
Nanoelectronics, molecular electronics, single electron transistor.
Nanophotonics.
Nanobiotechnologies: DNA and protein biochips, molecular self-assembly and biology,

Learning outcomes

- Understand the challenges of nanotechnologies in the fields of information technology, materials, medicine, energy and the environment. Understand the physical phenomena of low dimensional structures. Reflect on future developments in Nano.
- Deepen the understanding of a technique for developing nanostructures by participating in the fabrication of a typical sample. Deepen the understanding of a technique for characterizing nanostructures by participating in the observation at the nanometric scale of this same sample
- Explain through the creation of an educational video the specific contribution of

Independent study

Objectifs : Deepen the knowledge of the course
Acquire knowledge on a field of nanotechnologies little or not covered in class
Work in groups (4-5 students)

Méthodes : Review the concepts covered in class
Create educational videos on a field of application little covered in class from scientific articles and with the help of the pedagogy department

Core texts

M. LAHMANI , C. BRECHIGNAC, P. HOUDY ., *LES NANOSCIENCES. TOME 1: NANOTECHNOLOGIES ET NANOPHYSIQUE. EDITIONS BELIN, 2004.*, Editions Belin, 2004
M. LAHMANI , C. BRECHIGNAC, P. HOUDY . *LES NANOSCIENCES. TOME 2: NANOMATÉRIAUX ET NANOCHIMIE.*, Editions Belin, 2006
M. LAHMANI , C. BRECHIGNAC, P. HOUDY .*LES NANOSCIENCES. TOME 3: NANOBIOTECHNOLOGIES ET NANOBIOLOGIE.*, Editions Belin, 2007

Assessment

Assessment of practical activity TP.
Evaluation of the Video Project activity.
Written final test