

# UE Materials science



Niveau d'étude  
Bac +4



ECTS  
3 crédits



Composante  
UFR PhITEM  
(physique,  
ingénierie, terre,  
environnement,  
mécanique)



Période de  
l'année  
Printemps (janv.  
à avril/mai)

- > **Langue(s) d'enseignement:** Anglais
- > **Ouvert aux étudiants en échange:** Oui
- > **Code d'export Apogée:** PAX8NCAC

## Présentation

### Description

This lecture aims to present the main classes of material and their physical properties via two complementary approaches. One is based on the bondings between atoms and how these bonds influence the elastic, thermal, and electrical conductivity properties of materials, whereas the second one is related to the Fermi surface analysis. Microscopical models of physical phenomena like permittivity, piezoelectricity, or ferromagnetism will be described and how the material properties change at the surface.

#### Contents

- Chapter 0 : Introduction - Functional materials
- Chapter 1: The various types of bonds and the classes of materials
- Chapter 2: Relationship between bonds and simple properties of materials (thermal, mechanical, electrical properties)
- Chapter 3: Quantum models of materials (Sommerfeld and band theory)
- Chapter 4: Dielectric, ferroelectric, piezoelectric, and magnetic properties and their measurements.
- Chapter 5: Surface properties

### Objectifs

Bibliography :

'Physique des matériaux', M. Gerl and J-P. Issi  
'Sciences des matériaux', M. Dupeux  
'Physics of materials', Y. Quéré  
'Engineering materials', Ashby and Jones  
'La matière à l'état solide', A. Guinier and R. Jullien  
'Des matériaux', J-P. Baillon and J-M. Dorlot

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## Heures d'enseignement

CM	CM	15h
TD	TD	10h

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## Pré-requis recommandés

General knowledge of physics and chemistry

**Période :** Semestre 8

## Infos pratiques

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### Lieu(x) ville

> Grenoble

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### Campus

> Grenoble - Domaine universitaire