PHY2342 Condensed Matter

[45h+10h exercises] 5 credits

This course is taught in the 2nd semester

Teacher(s): Luc Piraux, Gian-Marco Rignanese
Language: French
Level: Second cycle

Aims

This module gives an account of the essential elements of solid state physics

Main themes

Short overview of chemical bonding in solids, periodic crystal structures, reciprocal lattice
Thermal properties : lattice dynamics, specific heat capacity, Debye model, phonons, effects due to anharmonicity
Quantum states of electrons in solids : Bloch theorem, electronic band structure (the nearly free electron approximation, the tight binding approximation), Brillouin zone, Fermi surface, motion of electrons, effective mass
The free electron gas :occupation of states, electronic specific heat, thermodynamical functions,)
Semiconductors : carrier charge density, impurity levels, the p-n junction, transistor
Transport phenomena : Boltzmann equation, electrical and thermal conductivities, electron-phonon collisions, Hall effect.
Superconductivity : fundamental phenomena, London equations
Methods :
Ex-cathedra courses, exercises.