



SOLID STATE PHYSICS I	
Enrollment year	2013/2014
Academic year	2014/2015
Regulations	DM270
Academic discipline	FIS/03 (MATERIAL PHYSICS)
Department	DEPARTMENT OF PHYSICS
Course	
Curriculum	FISICA DELLA MATERIA
Year of study	2°
Period	1st semester (13/10/2014 - 23/01/2015)
ECTS	6
Lesson hours	48 lesson hours
Language	Italian, English-friendly: textbook and other teaching material in English, exam in English upon request, lectures in English possible upon request
Activity type	ORAL TEST
Teacher	ANDREANI LUCIO (titolare) - 6 ECTS
Prerequisites	Basic notions of quantum physics, electromagnetism, optics, basic statistical mechanics (preferably).
Learning outcomes	Learning of basic concepts and physical phenomena related to solid state physics.
Course contents	The course deals with fundamental concepts of solid state physics, focusing on electron levels in crystalline solids, lattice vibrations, optical properties, semiconductor physics. The topics include: free electrons in metals, Drude and Sommerfeld theories; crystal lattices, Bloch theorem, electrons and holes; classification of solids and chemical bond; energy bands, basic methods for calculations and measurements, Fermi surfaces, electrons in a magnetic field; lattice vibrations and phonons; optical properties in insulators and semiconductors, complex dielectric function, interband transitions; homogeneous and inhomogeneous

	semiconductors, drift and diffusion, p-n junction, photovoltaic cells (monographic subject). The presentation of concepts and theoretical methods will be complemented by phenomenological examples, by discussion of the main experimental techniques for the measurement of physical quantities and by computational exercise sessions.
Teaching methods	Lectures, complemented by a few exercises and lab visits
Reccomended or required readings	<p>G. Grosso and G. Pastori Parravicini, Solid State Physics (Academic Press, 2000; 2nd ed., 2014)</p> <p>N.W. Ashcroft, N.D. Mermin, Solid State Physics (Holt-Rinehart, 1976)</p> <p>P.Y. Yu, M. Cardona, Fundamentals of Semiconductors: Physics and Material Properties, 4rd edition (Springer, 2010)</p> <p>F. Bassani and U. Grassano, Fisica dello Stato Solido (Bollati Boringhieri, 2000)</p>
Assessment methods	Oral examination. For the examination it is recommended to focus on physical aspects (qualitative trends, figures, methods for measuring various physical properties) rather than on a detailed study of mathematical derivations.
Further information	Oral examination. For the examination it is recommended to focus on physical aspects (qualitative trends, figures, methods for measuring various physical properties) rather than on a detailed study of mathematical derivations.
Sustainable development goals - Agenda 2030	\$lbl_legenda_sviluppo_sostenibile