

PHYSICAL PROPERTIES OF MATTER: SCALE EFFECTS

MASTER MODULE	SEMESTER	CREDITS	COURSE TYPE
Nanotechnology: physics and applications	2	6	Optative
PROFESSOR(S)	CONTACT DETAILS		
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	TUTORIALS TIMETABLE		
	María Luisa Jiménez Olivares José Callejas Fernández Arturo Moncho Jordá		
MASTER DEGREE			
University Master in Physics: Radiations, Nanotechnology, Particles and Astrophysics, University of Granada			
TEACHING DATES AND TIMES			
PRE-REQUISITES FOR REGISTRATION			
General requirements to access the master degree.			
BRIEF CONTENTS DESCRIPTION			
Introduction: general outlines. Mechanical properties. Electric and Magnetic properties. Nanoparticles in a fluid medium. Experimental measurements and applications			
PROGRAM			



I. INTRODUCTION

Nanomaterials. Classification. Assembly and self-assembly.

II. MECHANICAL PROPERTIES OF MATERIALS IN THE NANOMETRIC SCALE

Generalities. Effect of the size on the elastic response of materials. Nanotubes. Graphene. Nanoprobes and nano tweezers.

III. ELECTRIC AND MAGNETIC PROPERTIES OF NANOMATERIALS

Introduction: mechanisms of electric and magnetic polarization of materials. Electric conductivity of nanomaterials: scattering of surfaces. Quantum effects: ballistic conduction and tunnel effect. Magnetism at the nanometric scale. Superparamagnetism. Surface effects.

IV. NANOPARTICLES DISPERSED IN A LIQUID MEDIUM: STRUCTURES

Theory of liquids. Structure of dispersed systems: the structure factor. Integral equation theory. Dynamics: Brownian motion. Simulation techniques: Molecular Dynamics, Monte Carlo and Brownian Dynamics.

V. EXPERIMENTAL DETERMINATION OF STRUCTURAL AND DYNAMIC PROPERTIES OF NANOPARTICLE SYSTEMS

BIBLIOGRAPHY

1. Cao G. Nanostructures and nanomaterials. Imperial College Press, Londres, 2004.
2. Ozin GA, Arsenault AC. Nanochemistry. RSC Publishing. Cambridge, 2005.
3. Chaikin RM, Lubensky TC. Principles of Condensed Matter Physics. Cambridge University Press, Cambridge, 2000.
4. McQuarrie DA. Statistical Mechanics. Harper-Collins, New York, 1976.
5. Hansen JP, McDonald IR. Theory of simple liquids. Academic Press, New York, 1986.

