

Course Unit Descriptor

Study Programme: Physics			
Course Unit Title: Semiconducting and nano-materials			
Course Unit Code: M18PMN			
Name of Lecturer(s): Full Professor Srđan Rakić			
Type and Level of Studies: Master Academic Studies in Physics			
Course Status (compulsory/elective): Compulsory			
Semester (winter/summer): Winter			
Language of instruction: English			
Mode of course unit delivery (face-to-face/distance learning): Face-to-face			
Number of ECTS Allocated: 8			
Prerequisites: None			
Course Aims: The aim of this course is to gain an extensive knowledge of the properties of semiconductors and band structure with particularly accent to semiconducting nanomaterials.			
Learning Outcomes: On completion of this module, student should be able to understand basic ideas of electronic states in nanomaterials.			
Syllabus: <i>Theory</i> Drude and Sommerfeld theory of free electrons and their disadvantage. Crystal and reciprocal lattice. Types of crystal lattice. Diffraction of X-rays. Properties of electrons in periodical potentials. Bloch theorem. Brillouin zone. Boundary conditions at the surface. The influence of grain size („size effects“) in nanoscale materials. Free electrons in 2D structures and zonal structures. The zonal structure in 3D. Fermi-surface. Classical and quantum theory of harmonic oscillation in crystals. Phonons. Defects in crystals. Homogeneous and dishomogeneous semiconductors and nanomaterials. Electron interactions and magnetic structure. Magnetic ordering.			
Required Reading:			
Weekly Contact Hours:	Lectures: 3	Practical work: 3	
Teaching Methods: Lectures, theoretical practice, experimental practice.			
Knowledge Assessment (maximum of 100 points): 100			
Pre-exam obligations	points	Final exam	points
Active class participation	10	written exam	-
Practical work	-	oral exam	50
Preliminary exam(s)	-	Homework	20
Seminar(s)	20		