

Study Programme: Physics			
Course Unit Title: Advanced quantum mechanics			
Course Unit Code: F18NKM			
Name of Lecturer(s): Full Professor Milica Pavkov – Hrvojević, Assistant Professor Petar Mali			
Type and Level of Studies: Master Academic Degree			
Course Status (compulsory/elective): Elective			
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:			
Course Aims: Students will gain an extensive knowledge of the quantum physics and applications of modern solid state physics.			
Learning Outcomes: On completion of this module, student should be able to understand basic ideas and reasoning behind the development of quantum theory and its application to solid state physics.			
Syllabus:			
<i>Theory</i>			
Simplified model for an electron in a one-dimensional periodic potential. The Kronig-Penney model. Wave functions of a particle in a periodic potential. Bloch theorem. Born–von Karman boundary condition. Numerical solutions for Schrödinger equation in different types of potential. WBK approximation. Born – Oppenheimer approximation. Symmetries in quantum mechanics. Density matrix. Formalism of density matrix. Expectation values. Graphene and Dirac equation.			
<i>Practice</i>			
Problem solving.			
Required Reading:			
1. L. D. Landau, E.M. Lifschitz; Course of Theoretical Physics Vol.3 Quantum Mechanics (Butterworth-Heinemann 1997)			
2. J. J. Sakurai, Modern Quantum Mechanics Addison-Wesley 1995			
3. F. Schwabl, Advanced Quantum Mechanics. Springer, Heidelberg 3rd Ed. 2005			
D. Griffiths, David J.: Introduction to Quantum Mechanics, Essex: Pearson, 2014			
Weekly Contact Hours:	Lectures: 3	Practical work: 2	
Teaching Methods: Lectures			
Knowledge Assessment (maximum of 100 points):			
Pre-exam obligations	points	Final exam	points
Active class participation	10	written exam	
Practical work	10	oral exam	70
Preliminary exam(s)	10	
Seminar(s)	5		

The methods of knowledge assessment may differ; the table presents only some of the options: written exam, oral exam, project presentation, seminars, etc.