

Type of study : Master
Module title: Advanced quantum mechanics
Module type: Elective
No ESPB: 8
Prerequisites :
Module 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: 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.
Reading list: <ol style="list-style-type: none"> 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 4. D. Griffiths, David J.: Introduction to Quantum Mechanics, Essex: Pearson, 2014
Contact hours: 3+2
Methods of delivery: Lectures (3 hours per week), Solving problems (2 hours per week)