Module type: Master

Module title: Semiconducting and nano-materials

Module type: obligatory

No ESPB: 8

Prerequisites :

Module 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

Drude and *Somemerfild* theory of free electrons and thier disadvantage. Crystal and reciprocal lattice. Types of crystal lattice. Diffraction of X-rays. Properties of electrons in periodical potentials. Bloch theorem. Brillouin zone. Гранични услови на површини. 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 oscilation in crystals. Phonons. Defects in crystals. Homogeneous and dishomogeneous semiconductors and nanomaterials. Electron interactions and magnetic structure. Magnetic ordering.

Reading list

1. *Solid State Physics* Aschroft W Neil, Mermin N David, Saunders College Publishing, (1976)
2. *Intoduction to nanomatirials and nanotehnology* Vladimir Pokropivny, Rynno Lohmus, Irina Hussainova, Alex Pokropivny, Sergey Vlassov, Тарту, (2007)
3. *Nanostructures and Nanomaterials,* Guozhong Cao, Ying Wang , World Scientific Series in Nanoscience and Nanotechnology: Volume 2 (2011)

Број часова активне наставе: 3+2+1

Method of delivery

Lectures (3 hours per week), theor. practice (2 hour per week), exp. practice (1 hours per week).