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|  **UNIVERSITY OF NIŠ** |
| **Course Unit Descriptor** | **Faculty** | Faculty of Science and Mathematics |
| **GENERAL INFORMATION** |
| **Study program**  | **Physics** |
| Study Module (if applicable) |  |
| Course title | Fundamentals of Solid State Physics |
| Level of study | ☒Bachelor ☐Master’s ☐ Doctoral |
| Type of course | ☒ Obligatory ☐Elective |
| Semester  | ☐Autumn ☒Spring |
| Year of study  | 3 |
| Number of ECTS allocated | 6 |
| Name of lecturer/lecturers | Ljiljana Kostić |
| Teaching mode | ☒Lectures ☐Group tutorials ☐ Individual tutorials☒Laboratory work ☐ Project work ☐ Seminar☐Distance learning ☐ Blended learning ☒ Other |
| **PURPOSE AND OVERVIEW (max. 5 sentences)** |
| The course provides a comprehensive introduction to the concepts of Solid State Physics. It explains the structure of crystals, different kinds of imperfections in crystals, theory of crystal diffraction, bonding in solids, phonons and crystal vibrations, elastic and thermal properties of solids. Acquired knowledge is necessary for further scientific and professional work, research work and application of solid state physics in modern physics of materials. |
| **SYLLABUS (brief outline and summary of topics, max. 10 sentences)** |
| **Crystal Structure**: Periodic array of atoms, Lattice translation vectors, Primitive lattice cell, Fundamental types of lattices, Index system for crystal planes, Simple crystal structures. **Wave Diffraction and the Reciprocal Lattice**: Diffraction of waves by crystals, Bragg's Law, Scattered wave amplitude, Reciprocal lattice vectors, Diffraction conditions, Laue equations, Structure factor and Atomic form factor. **Imperfections in Crystals**: Point defects, Dislocations. **Bonding in Solids**: Crystals of inert gases, Ionic crystals, Covalent crystals, Metallic bonding, Hydrogen bond. **Elastic Constants**: Analysis of elastic strains, Dilation, Stress components, Elastic compliance and stiffness, Elastic energy density, Elastic stiffness constants of cubic crystals, Elastic waves in cubic crystals. **Phonons and Crystal Vibrations:** Vibrations of crystals with monatomic lattice, Two atoms per primitive lattice, Quantization of elastic waves, Inelastic scattering by phonons. **Thermal Properties:** Phonon heat capacity, Density of states, Einstein model, Debye model, Thermal expansion, Thermal conductivity, Thermal resistivity of phonon gas. |
| **LANGUAGE OF INSTRUCTION** |
| ☒Serbian (complete course) ☐ English (complete course) ☐ Other \_\_\_\_\_\_\_\_\_\_\_\_\_ (complete course)☐Serbian with English mentoring ☐Serbian with other mentoring \_\_\_\_\_\_\_\_\_\_\_\_\_\_ |
| **ASSESSMENT METHODS AND CRITERIA** |
| **Pre exam duties** | **Points** | **Final exam** | **points** |
| **Activity during lectures** | **5** | **Written examination** | **20** |
| **Practical teaching** | **15** | **Oral examination** | **20** |
| **Teaching colloquia** | **40** | **OVERALL SUM** | **100** |
| **\*Final examination mark is formed in accordance with the Institutional documents** |