

Specification for the book of courses

Study program		Electrical Engineering and Computer Science		
Module		Common		
Type and level of studies		Doctoral studies		
The name of the course		Materials Science		
Lecturer (for lectures)		Mitić V. Vojislav		
Lecturer/associate (for exercises)				
Lecturer/associate (for OFE)				
Number of ECTS		10	Course status (obligatory/elective)	Elective
Prerequisites				
Course objectives				
The subject offers academic knowledge on materials science and enables to interlink knowledge from different areas of research. It offers an insight into the most recent achievements in the research and application of advanced materials. It also focuses on the study of the structure-properties-application relationship.				
Course outcomes				
Students develop the capacity to deal with scientific, development an technological problems either alone or as members of a team, as well as to organize and implement scientific research. They should also be able to take part in international research projects owing to the experience gained through the research during studies.				
Course outline				
Matter and materials. Materials science as an international priority issue. Materials science and engineering. The synthesis (technology) – structure – properties – materials application correlation. Materials-energy-information. Structural properties of materials. Structural hierarchy of materials and symmetry. Crystallography. Modern materials characterization methods (SEM, TEM, EDS, XRD, laser and NMR spectroscopy). Stereological methods (quantitative metallography). Fractals theory as a link between the order and chaos in the material world. Application of fractals in the structural analysis and properties' simulation and materials synthesis technology. Inter-atomic links. Energy and crystal lattices. Crystal defects. Modelling and simulation of novel structures and properties of materials. Phase diagrams and designing of novel materials with controlled properties. Models of the electronic structure of materials. Electric conductivity in metals. Semiconducting materials and their properties. Quantum gaps. Optical properties of semiconductors. The age of electronic ceramic materials. Advanced oxide and non-oxide materials. Liquid crystals. Ferroelectrics. Ferrites and other materials with magnetic properties. Nanopowders, nanomaterials and nanotechnology of the synthesis of advanced materials. Role of materials structure in the high integration of electronic components and electronic parameters in microelectronic devices. Globalization and strategy of research and development of new materials and technologies in the world.				
Theoretical teaching				
Part of the exercises and lectures are performed at institutes, laboratories, companies and the Center for Electronic Microscopy.				
Practical teaching (exercises, OFE, study and research)				
Textbooks/references				
1	Vojislav V. Mitić, Momčilo M. Ristić, Electrical materials, (in the process of publishing, in Serbian)			
2	Vojislav V. Mitić, Materials for new and alternative energy sources, (in the process of issuing publishing, in Serbian)			
3	Vojislav V. Mitić, Structure and electrical properties of BaTiO ₃ ceramics, Belgrade, Endowment Andrejević, 2001. (in Serbian)			
4	D.Raković, Physical basics and characteristics of electrical materials, Belgrade, (1997) (in Serbian)			
5	W.D.Callister, "Materials Science And Engineering an introduction, John Wiley&Sons Ltd, 2003			
Number of classes of active education per week during semester/trimester/year				
Lectures	Exercises	OFE	Study and research work	Other classes
3	0	0	0	0
Teaching methods				
Lectures and consultations. For the theoretical part of the curriculum that includes a seminar paper, the research is conducted in university laboratories, institutes and factories.				
Grade (maximum number of points 100)				
Pre-exam duties		Points	Final exam	Points
Activity during lectures			Written exam	
Exercises			Oral exam	50
Colloquia				
Projects		50		