

Study program : Electrical and computer engineering				
Type and level of studies: Doctoral studies (third level of studies)				
Course unit: The amorphous materials, nanomaterials and nanotechnologies				
Teacher in charge : Nebojša S. Mitrović, Aleksandra S. Kalezić-Glišović				
Language of instruction: English				
ECTS: 10				
Prerequisites: -				
Semester: Winter Semester				
Course unit objective				
The introduction into the importance of the amorphous materials, nanomaterials and nanotechnologies, the possibilities and the limits of the application as well as the prospects for the synthesis of amorphous and nanomaterials and the application in new areas of technology.				
Learning outcomes of Course unit				
Acquiring the basic knowledge of the structural field and application of the advanced amorphous materials and nanomaterials, as well as in the field of existing nanotechnologies.				
Course unit contents				
<u>Theoretical classes</u>				
The introduction in nanomaterials and nanotechnologies. The history of nanomaterials. The effect of nanostructural factor on the material properties. Atoms, clusters and nanomaterials. The changes in material properties correlate with nanostucturalization of the elements of their composition. The change of mechanical properties. The mechanisms of strengthening and increasing toughness. The magnetic properties of clusters. The classification of the magnetic nanomaterials. The single-domain particles of the ferry-magnetic nanopowders. The optical properties of the nanomaterials. The light absorption of semiconductive nanomaterials. The prospects and the assessment of the development direction of nanoelectronic industry.				
<u>Practical classes</u>				
The nanostructural synthesis. The basic operations in nanotechnologies. The processes snd technologies of obtaining ultrafine powders of metals and oxides. The chemical and physical methods of the nanopowder synthesis. The plasma, the synthesis process, the laser synthesis. The obtaining of nanostructures by the amorphous materials transformation.				
Literature				
[1] A. Inoue, K. Hashimoto (ed.), <i>Amorphous and Nanocrystalline Materials</i> , Springer-Verlag, Berlin 2001.				
[2] B. Idzikowski, P. Svec, M. Miglierini (ed.), <i>Properties and Applications of Nanocrystalline Alloys from Amorphous Precursors</i> , Kluwer Academic Publishers, Dordrecht, 2005.				
[3] G. Schmid (ed.), <i>Nanotechnology, Assessment and Perspectives</i> , Springer, Berlin Heidelberg New York 2006.				
[4] D. Sellmyer, R. Skomski, (ed.), <i>Advanced Magnetic Nanostructures</i> , Springer, Berlin Heidelberg New York 2006.				
[5] Y. Liu, D. J. Sellmyer, D. Shindo, (eds.), <i>Handbook of Advanced Magnetic Materials</i> , Vol. 1. Nanostructural Effects, Springer, New York, 2006.				
[6] A. Korkin E. Gusev, J. Labanowski, S. Luryi, (ed.), <i>Nanotechnology for Electronic Materials and Devices</i> , Springer, Berlin Heidelberg New York 2007.				
[7] M. J. Jackson, <i>Micro and Nanomanufacturing</i> , Springer, Berlin Heidelberg New York 2007.				
[8] J. Šestak, M. Holeček, J. Malek (ed.), <i>Some Thermodynamic, Structural and Behavioral Aspects of Materials Accentuating Non-crystalline States</i> , Institute of Physics, Academy of Sciences of Czech Republic, Pilsen 2009.				
[9] M. A. Willard, M. Danil, <i>Nanocrystalline Soft Magnetic Alloys, Two Decades of Progress</i> , K. H. Buschow (ed.), <i>Handbook of Magnetic Materials</i> , Vol. 21, Elsevier, B. V. Amsterdam, 2013.				
Number of active teaching hours				Other classes
Lectures: 5	Practice: 2	Other forms of classes	Independent work:	
Teaching methods: Lessons, consultations, study and research work.				
Examination methods (maximum 100 points)				
Exam prerequisites	No. of points:	Final exam	No. of points:	
Student's activity during lectures		oral examination	50	
practical classes/tests		written examination		
Seminars/homework	30/20			
Project				

Other			
Grading system			
Grade	No. of points	Description	
10	91-100	Excellent	
9	81-90	Exceptionally good	
8	71-80	Very good	
7	61-70	Good	
6	51-60	Passing	
5	less than 50	Failing	