Study program: Electrical and Computing Engineering
Type and level of studies: Doctoral studies (third level of studies)
Course unit: Amorphous Materials, Nanomaterials and Nanotechnologies
Teacher in charge: Nebojša S. Mitrović, Aleksandra S. Kalezić-Glišović
Language of instruction: English
ECTS: 15
Prerequisites: -
Semester: Winter

Course unit objective

The introduction into the importance of amorphous materials, nanomaterials and nanotechnologies, the possibilities and the limitations of the application as well as prospects for the synthesis of amorphous and nanomaterials and their application in new areas of the technology.

Learning outcomes of Course unit

Acquiring 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

Theoretical classes

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.

Practical classes

Nanostructural synthesis. Basic operations in nanotechnologies. Processes and technologies of obtaining ultrafine powders of metals and oxides. Chemical and physical methods of the nanopowder synthesis. Plasma, the synthesis process, the laser synthesis. Otaining nanostructures by the amorphous materials transformation.

Literature

[1] A. Inoue, K. Hashimoto (ed.), *Amorphous and Nanocrystalline Materials*, Springer-Verlag, Berlin 2001.
[2] B. Idzikowski, P. Svec, M. Miglierini (ed.), *Properties and Applications of Nanocrystalline Alloys from Amorphous Precursors*, Kluwer Academic Publishers, Dordrecht, 2005.
[3] J. Šestak, M. Holeček, J. Malek (ed.), *Some Thermodynamic, Structural and Behavioral Aspects of Materials Accentuating Non-crystalline States*, Institute of Physics, Academy of Sciences of Czech Republic, Pilsen 2009.
[4] G. Schmid (ed.), *Nanotechnology, Assessment and Perspectives*, Springer, Berlin Heidelberg New York 2006.
[5] D. Sellmyer, R. Skomski, *Advanced Magnetic Nanostructures*, Springer, Berlin Heidelberg New York 2006.
[6] M. J. Jackson, *Micro and Nanomanufacturing*, Springer, Berlin Heidelberg New York 2007.

Number of active teaching hours				**Other classes**
Lectures: 5	Practice: 5	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**		
Project	**20**		
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