Table 5.2 Course specification

Type and level of studies: Bachelor

Course name: Fundamentals of Nanoscience and Nanotechnology

Course status: elective

Number of ECTS credits: 6

Requirement: none

Course aim

The aim of this course is to introduce students with basic nanochemistry and nanotechnology terms, as well as adoption of modern concepts from nanochemistry, including theoretical principles, divisions of nanomaterials, syntheses of nanomaterials, nanocharacterisation of materials, nanomaterials application, as well as trends of nanotechnology development.

Course outcome

After the course, students will be able to express functional and applicable understanding of physicochemical and specific properties of nanostructures, their application and modern nanotevchnology. Students will be able to perform and discuss the basic knowledge on contemporary and novel materials and technologies.

Course content

Theory

Syntheses and stabilisation of nanoparticles; nanomaterials syntheses pathways ”bottom-up” and ”top-down”. Influence of the size on the structure and morphology of nanoparticles. Optical properties of nanoparticles. Nanoparticles in science and technology (nanocrystals, carbon nanomaterials, nanowires, quantum dots, organic nanopolymers, oxide nanoparticles, porous silicates, composite and bionanomaterials, sensors and biosensors, nanofilms, nanocoatings, nanoclusters, nanoporous materials, nanocatalysts, nanodrug carriers). Self-assembling nanostructures. Experimental techniqies of nanomaterial characterisation (AFM, GPC/SEC, SEM, DLS, TEM).

Practice: Practical classes, OFT, SRW

Students will be introduced with the basic knowledge from nanochemistry, nanotechnology, and nanomaterials structures through the use of basic principles of nanomaterials syntheses, separation, as well as characterisation by the following methods: GPC, TEM, EM, AFM, SEM, DLS.

Literature

1. Nanochemistry, G.B. Sergeev, Elsevier, 2006.
2. The chemistry of nanostructured materials, Peidong Yang (Editor), World Scientific, 2003.
3. Dekker Encyclopedia of Nanoscience and Nanotechnology, Sergey Edward Lyshevski (Editor), CRC Press, 2009.
4. The Chemistry of Nanomaterials, Synthesis, Properties and Applications, C. N. R. Rao, A. Muller, A. K. Cheetham,WILEY-VCH, 2004.
5. Nanostructures and Nanomaterials: Synthesis, Properties and Application, G. Cao, Y. Wang, World Scientific Publishing Co. Pte. Ltd., ISBN-13: 978-981-4322-50-8, 2011.

Number of classes of active teaching				Other classes
Lectures: 3 (45)	Practice: 2 (30)	OFT:	SRW:	

Teaching methods

Lectures, practical teaching, seminars, consultations.

Assessment of knowledge (maximum of 100 points)

Pre-exam obligations	**Points**	**Final exam**	**Points**
activity during lecture classes	**5**	written exam	**25**
practical teaching	**20**	oral exam	**20**
seminars	**30**	.....	