

Study program: Integrated academic studies in dentistry			
Type and level of the study program: Integrated academic studies			
Course title: Nanostructured biomaterials in dentistry (DV-NANBM)			
Teacher: Larisa P. Blažič, Dubravka M. Marković, Karmen M. Stankov, Marija R. Jevtić, Bojan B. Petrović, Ivana R. Kantardžić			
Course status: elective			
ECTS Credits: 3			
Condition: -			
Course aim The aim of this course is to acquaint students with modern nanotechnologies, new diagnostic and therapeutic possibilities enabled by novel accomplishments of nano-science and nanotechnology in the field of dentistry, as well as providing insight into the specificities of nanostructured biomaterials and nano-devices.			
Expected outcome of the course: The course will provide students with basic knowledge of modern nanotechnology accomplishments, nano-structured biomaterials and nano-devices in the field of dentistry. The subject provides students the basic knowledge and skills in the field of modern nanotechnology, nanostructured biomaterials and nano-devices in the field of dentistry, directs students towards scientific thinking and research, and provides basic level of knowledge in the field of nano-science. The course will offer students the possibility to extend their knowledge in this field throughout advanced study levels and to keep in line with the novel accomplishments of technological revolution.			
Course description <i>Theoretical education</i> <ol style="list-style-type: none"> 1. Nanoscience and nanotechnologies – definition, history, technological revolution, multidisciplinary approach, importance 2. Nanotechnology—from basic to applied science-nanomaterials, nanometrology, electronics, optoelectronics, information and communication technology, bionanotechnology and nanomedicine. 3. Nanoparticles - production process (methods of synthesis of nanoparticles), direct molecular synthesis and connectivity, the unique physical and chemical properties, the problems of controlling the properties of nanoparticles 4. Nanomedicine definitions, scope of application, accomplishments in various branches of medicine 5. Nanomedicine-targeted delivery of drugs, pharmacokinetics and pharmacodynamics of nanoparticles, the potential side effects 6. Nanomedicine-tech, manipulation at the atomic and molecular level, molecular medicine 7. Nanomedicine-targeted delivery of genetic material, anti-cancer potential 8. Nanomaterials - physico-chemical, mechanical, optical, electrical, thermal properties of nanomaterials 9. Nanostructured biomaterials in dentistry - unique features, biomimetic approach - matching the natural structure and properties of biological materials, nano-coatings, current research 10. Nanostructured biomaterials in dentistry - applications in different industries, nanocomposites, surface nano modification of dental implants, and nano scaffolds and nanomembranes for guided tissue regeneration, ceramics reinforced with nanoparticles, remineralization with nanoparticles, the potential applications of nanorobots 11. Methods for characterization of nanomaterials in dentistry - microscopic techniques (scanning tunnel microscopy, atomic force microscopy, transmission microscopy), nanoindentation and related techniques of characterization 12. Environment protection - aspects of the impact of nanoparticles on ecosystems 13. Guidelines on the protective measures when working with nanomaterials, measurement of pollution and toxic potential, the need for systemic regulation 14. Social and ethical considerations 15. The potential impact on science and practice in the future <i>Practical education: exercises, other forms of education, research related activities</i> Practical instruction is closely linked with the lectures encompassing visits to relevant departments, clinics and laboratories of the Faculty of Medicine to learn about characterization and application of nanotechnology in biomedicine and dentistry, as well as discussions on current accomplishments in the field of application of nanotechnology in dentistry.			
Literature <i>Compulsory</i> 1. Subramani K, Ahmed W. Emerging Nanotechnologies in Dentistry: Processes, Materials and Applications. Waltham, MA:Elsevier Inc; 2012. <i>Additional</i> -			
Number of active classes			Other:
Lectures: 30	Practice: 15	Other types of teaching: Research related activities:	
Teaching methods Lectures and practical.			
Student activity assessment (maximally 100 points)			
Pre-exam activities	points	Final exam	points
Lectures	20*	Written	60
Practices	20*	Oral	
Colloquium		
Essay			

*10 attendance + 10 activity