Specification for the book of courses

Study program	Electrical Engineering and Computer Science		
Module	Electron Devices and Microsystems		
Type and level of studies	Undergraduate Academic Studies		
The name of the course	Nanotechnology		
Lecturer (for lectures)	Paunović V. Vesna, Aleksić M. Sanja		
Lecturer/associate (for exercises)	Aleksić M. Sanja		
Lecturer/associate (for OFE)			
Number of ECTS	5	**Course status (obligatory/elective)**	Elective
Prerequisites			
Course objectives	Nanotechnology is designed for students who wish to learn more about the foundations of nanotechnology, technological advances and the applications enabled by nanotechnology.		
Course outcomes	By the end of the course students will be expected to demonstrate a basic knowledge of the physical principles and understanding of some of the most common applications of nano-scale phenomena and how these relate to the solution of nanotechnology problems in industry.		
Course outline			
Theoretical teaching	Scientific revolutions. Types of nanotechnology and nanomachines. Surfaces and dimensional space – top down and bottom up. Forces between atoms and molecules.Opportunity at the nano scale. Length and time scale in structures. Influence of nano structuring on mechanical, optical, electronic, magnetic and chemical properties. Electronic transport in quantum wires and carbon nano tubes. Magnetic behavior of single domain particles and nanostructures. BULK NANOSTRUCTURED MATERIALS: Quantum wells, wires and dots. Size and dimensionality effects, Carbon nanotubes (CNTs). Single walled carbon nanotubes (SWNTs), Multiwalled carbon nanotubes (MWNTs), graphenes, fullerenes. Metal/oxide nanoparticles, nanorods, nanowires, nanotubes, and nanofibers. Semiconductor quantum dots. GAS SENSOR MATERIALS: Criteria for the choice of materials. Discussion of sensors for various gases. Gas sensors based on semiconductor devices. BIOSENSORS: Principles. DNA based biosensors. Protein based biosensors. SEMICONDUCTOR NANODEVICES: Single electron devices. Nano scale MOSFET – resonant tunneling transistor. Single electron transistors. Nanorobotics and nanomanipulation. Nanocomputers. Optical fibers for nanodevices. DNA based nanodevices. Micro and Nanomechanics. Nanotechnology for sustainable energy.		
Practical teaching (exercises, OFE, study and research	To demonstrate familiarity with the topic and ability to communicate concepts across discipline boundaries each student in the course is expected to give a short oral presentation on a topic related to his /her own research interst to nanotechnology.		
Textbooks/references			
1	S. Kelley, T. Sargent, Introduction to Nanotechnology: The New Science of Small, The Great Courses, The Teaching Company, 2012.		
2	G.L. Hornyak, J.J. Moore, H.F. Tibbals, J.Dutta, Fundamentals of Nanotechnology, CRC Pres, 2018		
3	L.E. Foster, G. Allen, Nanotechnology: Science, Innovation, and Opportunity, Prentice Hall Professional Technical Reference, 2005.		
4	M. Kohler, W. Fritzsche, An Introduction to Nanostructuring Techniques, 2005.		
5	Charles P.Poole Jr and. Frank J.Owens, “Introduction to Nanotechnology”, Wiley Interscience, 2003.		

Number of classes of active education per week during semester/trimester/year				
Lectures	**Exercises**	**OFE**	**Study and research work**	**Other classes**
2	2	0	0	0
Teaching methods	Lectures, consultations, exercises, computer exercises, seminar work.			

Grade (maximum number of points 100)			
Pre-exam duties	**Points**	**Final exam**	**Points**
Activity during lectures	5	**Written exam**	25
Exercises		**Oral exam**	25
Colloquia	20		
Projects	25		