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|  **UNIVERSITY OF NIŠ** |
| **Course Unit Descriptor** | **Faculty**  | **Electronic Engineering** |
| **GENERAL INFORMATION** |
| Study program  | Electrical Engineering and Computing |
| Study Module (if applicable) | Electronic Devices and Microsystems |
| Course title | Nanotechnology |
| Level of study | [x] Bachelor [ ]  Master’s [ ]  Doctoral |
| Type of course | [ ]  Obligatory [x]  Elective |
| Semester  | [ ]  Autumn [x] Spring |
| Year of study  | 4 |
| Number of ECTS allocated | 5 |
| Name of lecturer/lecturers | Paunović V. Vesna/Pantić S. Dragan |
| Teaching mode |  [x] Lectures [x] Group tutorials [x]  Individual tutorials [x] Laboratory work [x]  Project work [ ]  Seminar [ ] Distance learning [ ]  Blended learning [ ]  Other |
| **PURPOSE AND OVERVIEW (max. 5 sentences)** |
| Nanotechnology is designed for students who wish to learn more about the foundations of nanotechnology, technological advances and the applications enabled by nanotechnology. 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. |
| **SYLLABUS (brief outline and summary of topics, max. 10 sentences)** |
| 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. |
| **LANGUAGE OF INSTRUCTION** |
| [x] Serbian (complete course) [x]  English (complete course) [ ]  Other \_\_\_\_\_\_\_\_\_\_\_\_\_ (complete course)[x] Serbian with English mentoring [ ] Serbian with other mentoring \_\_\_\_\_\_\_\_\_\_\_\_\_\_ |
| **ASSESSMENT METHODS AND CRITERIA** |
| **Pre exam duties** | **Points** | **Final exam** | **points** |
| **Activity during lectures** | **5** | **Written examination** | **20** |
| **Practical teaching** | **25** | **Oral examination** | **20** |
| **Teaching colloquia** | **30** | **OVERALL SUM** | **100** |
| **\*Final examination mark is formed in accordance with the Institutional documents** |