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|  **UNIVERSITY OF NIŠ** |
| **Course Unit Descriptor** | **Faculty**  | Faculty of Sciences and Mathematics |
| **GENERAL INFORMATION** |
| Study program  | Computer Science |
| Study Module (if applicable) | - |
| Course title | Natural Computing |
| Level of study | [ ] Bachelor [ ]  Master’s [x]  Doctoral |
| Type of course | [ ]  Obligatory [x]  Elective |
| Semester  |  [x]  Autumn [ ] Spring |
| Year of study  | second |
| Number of ECTS allocated | 12 |
| Name of lecturer/lecturers | Aleksandar Stamenković |
| Teaching mode |  [x] Lectures [ ] Group tutorials [ ]  Individual tutorials [ ] Laboratory work [ ]  Project work [x]  Seminar [ ] Distance learning [ ]  Blended learning [ ]  Other |
| **PURPOSE AND OVERVIEW (max. 5 sentences)** |
| Introducing the new unconventional calculation methods inspired by nature, neural, evolutionary, quantum and molecular calculations. Exploring the limits of the traditional calculation models and traditional computers, and finding possible ways of overcoming these boundaries by implementation of new unconventional calculation models. |
| **SYLLABUS (brief outline and summary of topics, max. 10 sentences)** |
| Biological basis: cells, chromosomes and genes, molecular operations for assembling genes, recombination, biological membranes, membrane structure, membrane transport, cell division, neurons... Assembling genes (Gene Assembly): Formal models of gene assembly, assembly operations. Calculating DNA: Structure and function of DNA, DNA as the carrier of genetic information, operations on the DNA molecule, molecular models of calculation, calculation models of DNA, physical implementation, Adleman's experiment, the complexity of the issues, Watson-Crick automata, insertion-deletion systems, splicing models, H-systems. Membrane calculation: Membrane models, P-systems, the power of P-system. Quantum calculations: Quantum Phenomena, bit and qubit, quantum calculus, quantum logic, quantum computers, quantum algorithms, quantum implementations, quantum programming, Shor's algorithm, quantum complexity, quantum cryptography. Evolutionary algorithms. Neural networks. Celular Automata. |
| **LANGUAGE OF INSTRUCTION** |
| [x] Serbian (complete course) [ ]  English (complete course) [ ]  Other \_\_\_\_\_\_\_\_\_\_\_\_\_ (complete course)[ ] Serbian with English mentoring [ ] Serbian with other mentoring \_\_\_\_\_\_\_\_\_\_\_\_\_\_ |
| **ASSESSMENT METHODS AND CRITERIA** |
| **Pre exam duties** | **Points** | **Final exam** | **points** |
| **Activity during lectures** | **10** | **Written examination** | **20** |
| **Practical teaching** | **-** | **Oral examination** | **50** |
| **Teaching colloquia** | **20** | **OVERALL SUM** | **100** |
| **\*Final examination mark is formed in accordance with the Institutional documents** |