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|  **UNIVERSITY OF NIŠ** |
| **Course Unit Descriptor** | **Faculty**  | Faculty of Science and Mathematics |
| **GENERAL INFORMATION** |
| Study program  | **Mathematics** |
| Study Module (if applicable) | Mathematical models in physics |
| Course title | Mathematical methods in nonlinear dynamic |
| Level of study | [ ] Bachelor [x]  Master’s [ ]  Doctoral |
| Type of course | [ ]  Obligatory [x]  Elective |
| Semester  |  [ ]  Autumn [x] Spring |
| Year of study  | II |
| Number of ECTS allocated | 7.5 |
| Name of lecturer/lecturers | Jelena V. Manojlović |
| Teaching mode |  [x] Lectures [ ] Group tutorials [ ]  Individual tutorials [ ] Laboratory work [ ]  Project work [ ]  Seminar [ ] Distance learning [ ]  Blended learning [ ]  Other |
| **PURPOSE AND OVERVIEW (max. 5 sentences)** |
| *Course is an introduction to the most important concepts of nonlinear dynamics with applications.* Student has mastered the theoretical basis of the stability theory of differential equations such as bifurcation, chaos, fractals and strange attractors and should be able to apply the theory developed for the qualitative analysis of nonlinear dynamical systems and its applications in physics and engineering. In particular, the student is able to test the stability of dynamic systems with the use of software packages for graphic interpretation of the phase portraits. |
| **SYLLABUS (brief outline and summary of topics, max. 10 sentences)** |
| **Bifurcation** of one-dimensional and two-dimensional dynamical systems. **Three-dimensional dynamical systems and chaos:** The Rossler system and chaos. The Lorenz equation and attractor. Chua’s Circuit. **Chaos on strange attractors:** Lyapunov exponent. Chaotic orbits. Strange attractors. **Fractals:** Koch snowflake. Cantor set. Mandelbrot set. Sierpinski carpet. Fractal dimension.  |
| **LANGUAGE OF INSTRUCTION** |
| [x] Serbian (complete course) [ ]  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** |  | **Written examination** | **50 (depending on teaching colloquia)** |
| **Seminars** |  | **Oral examination** | **50** |
| **Teaching colloquia** | **50** | **OVERALL SUM** | **100** |
| **\*Final examination mark is formed in accordance with the Institutional documents** |