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|  **UNIVERSITY OF NIŠ** |
| **Course Unit Descriptor** | **Faculty**  | Faculty of Sciences and Mathematics |
| **GENERAL INFORMATION** |
| Study program  | Mathematics |
| Study Module (if applicable) |  |
| Course title | Generalized inverses and systems of differential equations |
| Level of study | [ ] Bachelor [ ]  Master’s [x]  Doctoral |
| Type of course | [ ]  Obligatory [x]  Elective |
| Semester  |  [ ]  Autumn [x] Spring |
| Year of study  | 1 |
| Number of ECTS allocated | 12 |
| Name of lecturer/lecturers | Nebojša Č. Dinčić |
| Teaching mode |  [x] Lectures [ ] Group tutorials [ ]  Individual tutorials [ ] Laboratory work [ ]  Project work [ ]  Seminar [ ] Distance learning [ ]  Blended learning [ ]  Other |
| **PURPOSE AND OVERVIEW (max. 5 sentences)** |
| Acknowledging the systems of differential equations, infinite dimensional linear systems and application of generalized inverses to its solving.Prospective student should master methods for solving some functional equations, linear systems of differential equations and infinite dimensional systems of linear equations, by application of Drazin inverse or otherwise. |
| **SYLLABUS (brief outline and summary of topics, max. 10 sentences)** |
| An introduction to differential equations and dynamical systems: uncoupled linear systems, diagonalization and Jordan form of matrix of the system. Matrix exponent and its properties. Fundamental theory for linear systems, and phase portrait in the 2x2 case. Basics of the stability theory.The application of Drazin inverse: some basic properties of Drazin inverse, applications of Drazin inverse to linear systems of differential equations; application of Drazin inverse to difference equations and Lesly model of population growth and backward population projection. Optimal control, matrix functions, and weak Drazin inverses. Infinite dimensional linear systems: an introduction and problem of associativity. Systems with infinite matrices, resolvent techniques, and geometrical approach. |
| **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** |  |
| **Practical teaching** |  | **Oral examination** | **50** |
| **Teaching colloquia** | **40** | **OVERALL SUM** | **100** |
| **\*Final examination mark is formed in accordance with the Institutional documents** |