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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) | Mathematical Models in Physics  |
| Course title | Unbounded Operators in Mathematical Physics |
| Level of study | [ ] Bachelor [x]  Master’s [ ]  Doctoral |
| Type of course | [x]  Obligatory [ ]  Elective |
| Semester  |  [x]  Autumn [ ] Spring |
| Year of study  | 2 |
| Number of ECTS allocated | 7.5 |
| 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)** |
| Introduction to the mathematical models of physics based on the theory of operators and functional analysis. Mastering the techniques that are used in mathematical physics, in particular Schrödinger operator, and spectral properties of unbounded linear operators. |
| **SYLLABUS (brief outline and summary of topics, max. 10 sentences)** |
| Spectral theory: Banach algebra, spectrum and resolvent, spectrum of Hermitian and compact operator. The spectrum of the normal operator.Unbounded operators on the Hilbert space: closed operators, their spectrum and resolvent. Unbounded symmetrical operators and spectral theorem for unbounded symmetrical operators. Compact operators and perturbations.Differential operators: elementary properties, adjoint operator and border problems of differential operators, resolvent, compact resolvent, general theory. Partial differential operators: Cauchy problem.Schrödinger operator: free Schrödinger operator, algebraic methods (for example, harmonic oscillator), one-dimensional Schrödinger operator, Schrödinger operator of a particle; Schrodinger operator of atoms; scattering theory. |
| **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** | **40** |
| **Practical teaching** |  | **Oral examination** |  |
| **Teaching colloquia** | **50** | **OVERALL SUM** | **100** |
| **\*Final examination mark is formed in accordance with the Institutional documents** |