|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **UNIVERSITY OF NIŠ** | | | | | | |
| **Course Unit Descriptor** | | **Faculty** | | | Faculty of Sciences and Mathematics | |
| **GENERAL INFORMATION** | | | | | | |
| Study program | | | | Mathematics | | |
| Study Module (if applicable) | | | |  | | |
| Course title | | | | Nonlinear Equations and Systems | | |
| Level of study | | | | Bachelor  Master’s  Doctoral | | |
| Type of course | | | | Obligatory  Elective | | |
| Semester | | | | Autumn Spring | | |
| Year of study | | | | 1 | | |
| Number of ECTS allocated | | | | 12 | | |
| Name of lecturer/lecturers | | | | Nebojša Č. Dinčić | | |
| Teaching mode | | | | Lectures Group tutorials  Individual tutorials  Laboratory work  Project work  Seminar  Distance learning  Blended learning  Other | | |
| **PURPOSE AND OVERVIEW (max. 5 sentences)** | | | | | | |
| Introduction to the theory of linear operator equations and a general problem of regularization.  Student is qualified for solving nonlinear operator equations by using various methods. Mastering Tikhonov regularization makes it possible to work with ill-conditioned problems. | | | | | | |
| **SYLLABUS (brief outline and summary of topics, max. 10 sentences)** | | | | | | |
| Nonlinear operator equation:  • Introductory remarks: non-linear operators and functionals; continuity, boundedness and differentiability of nonlinear operators; Fréchet derivative and integration of abstract functions. Urysohn operator in spaces C and Lp  • The existence of solutions: method of successive approximation, principle of contractive mappings, uniqueness of solutions, equations with completely continuous operators; Schauder principle, the use of the theory of completely continuous vector fields; variational methods; transformation of the equations  • Qualitative methods in the theory of branching solutions: extension of the solutions, implicit function theorem, branching points, bifurcation points; the principle of linearization  Tikhonov regularization for nonlinear problems: The general problem of regularization, ill-posed problems, the concept of regularization of Tikhonov, Introduction to Tikhonov regularization for nonlinear problems, analysis of convergence | | | | | | |
| **LANGUAGE OF INSTRUCTION** | | | | | | |
| 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** | | | | | | |