

|  |               |                               |                             |
|--|---------------|-------------------------------|-----------------------------|
| <b>Study program:</b> Mathematics (Ph.D. program)  |               |                               |                             |
| <b>Course:</b> Numerical Optimization  |               |                               |                             |
| <b>Course instructor(s):</b> Nataša Krejić   |               |                               |                             |
| <b>Course type (compulsory/elective):</b> elective   |               |                               |                             |
| <b>Credit points:</b> 10 ECTS  |               |                               |                             |
| <b>Prerequisites:</b> -  |               |                               |                             |
| <b>Course objectives:</b><br>Introduction of the numerical methods for solving optimization problems with and without constraints.   |               |                               |                             |
| <b>Learning outcomes:</b><br>The students will master the numerical methods which enable research work in optimization theory and will be able to apply them to real-life problems.  |               |                               |                             |
| <b>Course description (outline):</b><br>The optimization problem without constraints. Necessary and sufficient conditions. Linear search. Methods of confidence intervals. Newton-type methods. Method of least squares. Optimization problems with constraints. Theoretical foundations of algorithms. Problems of small and medium dimensions. Applications to models in economics and technology.   |               |                               |                             |
| <b>References:</b><br><ol style="list-style-type: none"> <li>1. Nocedal, J. Wright, S.J., Numerical optimization, Springer, 1999.</li> <li>2. Dennis, J.E., Schnabel, R.B., Numerical Methods for Unconstrained Optimization and Nonlinear Equations, SIAM 1996.</li> <li>3. Bartholomew- Biggs, M. Nonlinear Optimization with Financial Applications, Kluwer, 2005.</li> <li>4. M. Bazaraa, H.D.Sherali, C.M.Shetty, Nonlinear Programming, Theory and Algorithms, Wiley-Interscience, 2006</li> <li>5. K. Marti, Stochastic Optimization Method, Springer, 2005.</li> </ol> |               |                               |                             |
| <b>Active teaching hours</b>   |               | <b>Theoretical classes:</b> 2 | <b>Practice classes:</b> -6 |
| <b>Methods of teaching:</b><br>Lectures and practice, with active participation of the students, discussion, seminars, etc.  |               |                               |                             |
| <b>Grading structure</b>   |               |                               |                             |
| <b>Pre-exam obligations</b>  | <b>Points</b> | <b>Exam</b>                   | <b>Points</b>               |
| Colloquia  | 25            | Oral exam                     | 25                          |
| Seminars   | 25            |                               |                             |