Course: Stochastic optimization	
Course instructors: Nataša Krklec Jerinkić	
Course type: elective	
Credit points ECTS: 12	
Prerequisites: -	

Course objectives:
Introducing basic concepts of stochastic optimization, analysis of basic algorithms and their modifications.

Learning outcomes:
- Acquiring basic concepts of stochastic optimization;
- Ability of applying the taught algorithms on real-world problems;
- Ability to construct and analyze stochastic optimization methods.

Course description (outline):
Theoretical classes
Introducing stochastic optimization problems, noisy objective functions, stochastic constraints, probabilistic (chance) constraints, functions in the form of mathematical expectation. Concept of stochastic convergence. Approximations of functions in stochastic environment, Stochastic Approximation (SA) methods and Sample Average Approximation (SAA) methods. Convergence analysis of SA methods. Sampling methods for noisy functions approximations. Approximations of the derivatives, finite differences, simultaneous perturbations. Convergence analysis and statistical properties of SAA methods. Validation analysis. Concept of adaptive sample size methods.
Practice classes
Implementation of the theoretically analysed methods.

References:
Main:
1. Shapiro, A., Dentcheva, D. and Ruszczynski, A., 2021. *Lectures on stochastic programming: modeling and theory*. Society for Industrial and Applied Mathematics.
2. Spall, J.C., 2005. *Introduction to stochastic search and optimization: estimation, simulation, and control* (Vol. 65). John Wiley & Sons.

Textbooks (additional)
Selected papers in the field of stochastic optimization

Active teaching hours: 5	Theoretical classes: 5	Practice classes:

Methods of teaching:
Theoretical lectures and independent work of students during practical hours.

Grading structure (100 points)
50 points on pre-exam and 50 points on oral exam