Study programmes: Bachelor studies – Mathematics	
Course name: M4.14 – Mathematical Programming Methods	
Lecturers: Zorica Stanimirović	
Status: Compulsory	
ECTS: 5	
Attendance prerequisites: Introduction to Theory of Extremal Problems	

Course aims:
Acquisition of general, specific, and practical knowledge in Mathematical Programming Methods

Course outcome:
At the end of the course, a student will gain theoretical and practical knowledge in Mathematical Programming methods. A student will be able to identify mathematical programming problems in practice, to formulate correct mathematical model, and to apply adequate solution methods.

Course content:
- Mathematical Programming problems: definition, properties, and classification.
- Linear Programming. Foundations of Simplex Method. Duality Theory. Efficiency of Simplex Method.
- Integer Programming: definition, properties, and examples. Branch-and-Bound Method. Cutting Plane Method. Branch-and-Cut method.
- Nonlinear Programming. Unconstrained Optimization Methods. Constrained Optimization Methods.
- Heuristic and Metaheuristic Methods. Local Search. Simulated Annealing. Tabu Search. Variable Neighborhood Search. Evolutionary Algorithms. Particle Swarm Optimization. Bee Colony Optimization. Hybridization of metaheuristic methods. Hybridization of metaheuristics and exact methods. Matheuristics.
- Implementation of exact and (meta)heuristic methods for solving linear and nonlinear optimization problems. Application of optimization methods to real-life problems and performance comparison. The use of existing software packages for solving linear and nonlinear optimization problems.

Literature:
Griva, I., Nash, S.G., Sofer, A., *Linear and Nonlinear Optimization*, Siam, 2009.
Nocedal, J., Wright, S.J., *Numerical Optimization,* Springer, 2006.
Gendreau, M., Potvin, J.Y. (Eds.), *Handbook of Metaheuristics,* Springer, 2010.
E.G., *Metaheuristics-from design to implementation*. Willey & Sons Publications, 2009.
Stanimirović, Z., *Nelinearno programiranje*, Matematički fakultet, Univerzitet u Beogradu, 2011.
IBM Cplex Ilog Optimizer *http* : *//www.ibm.com/software/integration/optimization/cplex − optimizer/*

Number of hours: 4	Lecures: 2	Excersises: 2	Laboratory: -	Research: -

Teaching and learning methods: Frontal teaching/ Group work/ Practical work

Assessment (maximal 100 points)				
Course assignments	**points**	**Final exam**		**points**
Lectures		Written exam		30
Exercises / Tutorials		Oral exam		40
Colloquia	30			