No. 46

Course syllabus for First cycle studies						
1.	**Course title**	**Process modeling and optimization**				
2.	**Code**	MDE5M5				
3.	**Study Program**	Metallurgical Digital Engineering				
4.	**Study program organizer (unit, institute, department, division)**	Faculty of Technology and Metallurgy				
5.	**Degree (first, second, third cycle)**	first				
6.	**Academic year / semester**	Third	7.	**Number of ECTS 8**	Fifth	
8.	**Instructors**	Dr. Mirko Marinkovski, full professor				
9.	**Prerequisites for course enrollment**					
10.	**Objectives of the course syllabus (competences):** Gaining knowledge from process modeling and optimization **Acquired skills (competences):**					
11.	**Content of the course:** Basic principles for developing process models, role of models in digital metallurgical engineering, procedure for building mathematical models. Models based on transfer phenomena: molecular, microscopic, multiple gradient and maximum gradient description, kinetic terms, boundary conditions. Alternative classification of models based on transfer phenomena and population balance. Application in digital metallurgical engineering: simulation of models for calculating thermodynamic data and equilibrium, models for transfer of momentum, heat and mass. Nature and organization of optimization problems, development of optimization models, basic concepts of optimization, methods for optimization of functions without and with constraints, computer support for optimization of processes in digital metallurgical engineering with MATLAB Optimization Toolbox.					
12.	**Study methods:**					
13.	**Total available time**	210				
14.	**Allocation of available time**					
15.	**Teaching activities**	15.1.	Lectures - theoretical teaching. classes	45		
		15.2.	Exercises (laboratory, lecture), seminars, teamwork: classes	45		
		15.3.	Practice: classes	0		
16.	**Other types of activities**	16.1.	Project tasks: classes	20		
		16.2.	Independent tasks: lessons	20		
		16.3.	Homework - assignments	80		
17.	**Grading system**					
	17.1.	Tests: points		80		
	17.2.	Seminar paper/project, written and oral presentation: points		10		
	17.3.	Final exam: points		10		

18.	**Grading criteria (points/grade)**	Up to 61 points	5 (five) (F)
		From 61 to 69 points	6 (six) (E)
		From 70 to 79 points	7 (seven) (D)
		from 80 to 89 points	8 (eight) (S)
		From 90 to 95 points	9 (nine) (B)
		from 95 to 100 points	10 (ten) (A)
19.	**Prerequisites for taking the final exam**		
20.	**Language in which lectures are conducted**		
21.	**Method for monitoring the quality of lectures**		

22. **LITERATURE**

22.1. Compulsory literature

No.	Author	Title	Publisher	Year
1.	T. F. Edgar, D. M. Himmelblau, L. S. Lasdon	Optimization of Chemical Processes	McGraw-Hill Chem. Eng. Series	2001
2.	K. M. Hangos, I. T. Cameron	Process Modelling and Model Analysis	Academic Press, San Diego	2001
3.	D. Basmadijan	Art of Modelling in Science and Engineering	The Chapman&Hall/ CRC	1999

22.2. Additional literature

No.	Author	Title	Publisher	Year
1.				
2.				
3.				