No. 24

Attachment No.3		**Course syllabus for first cycle studies**				
1.	**Course title**	**Measurement, automatic control and monitoring systems**				
2.	**Code**	MDE6M3				
3.	**Study Program**	Metallurgical digital engineering				
4.	**Study program organizer (unit,institute, department, division)**	Faculty of Technology and Metallurgy - Skopje, University “Ss. Cyril and Methodius” in Skopje				
5.	**Degree (first, second, third cycle)**	First cycle				
6.	**Academic year / semester**	**Year**	III	**Semester**	VI	
7.	**Number of ECTS credits**	5				
8.	**Instructors**	PhD Stefan Kuvendziev, full professor				
9.	**Prerequisites for courseenrollment**	/				
10.	**Objectives of the course syllabus (competencies):** The aim of the course is to acquaint students with the principles of measuring process variables, management of processes, as well as implementation of automatic control systems and monitoring of technological processes.					
11.	**Content of the course:** Introduction to process control and design of process control systems; Defining SISO systems for automatic control: First, second and higher order transfer functions for SISO systems; Block diagrams’ symbols and nomenclature; Block diagrams’ algebra; Reduction of block diagrams; Transfer functions for systems in open and closed configuration; Transformation and reduction of complex block diagrams; Dynamics of systems in closed-loop configuration. Absolute stability of dynamic systems; Analysis and synthesis of automatic control systems; Study of various technological processes using MATLAB/Simulink; Fundamentals of measurement theory (metrology). Errors and types of errors. Transmission of measurement data. Interface for transmission of measurement data. Measurement results and their processing. Division of measuring instruments and instruments for automatic control; Theoretical foundations for studying the dynamics of measurement systems; Instruments for measuring pressure, temperature, flow and level; Equipment for continuous (industrial) measurement of composition and concentration; Instruments for measuring other process quantities. Computerized measurement systems and their application. Application of LabView software for visualization of measuring instruments. Monitoring systems and their application. PLC regulators, SCADA control system for dynamic monitoring.					
12.	**Study methods:** Lectures and exercises, consultations, project (homework, seminar) assignments, home study (exam preparation)					
13.	**Total available time**		150			
14.	**Allocation of available time**					
15.	**Teaching activities**	15.1.	Lectures		30	
		15.2.	Exercises (laboratory, computational), teamwork		30	
		15.3	Industrial practice		20	
16.	**Other types of activities**	16.1.	Project assignments		20	
		16.2.	Independent assignments		10	
		16.3.	Home study		40	
17.	**Grading system**					

	17.1.	Tests: pts	80
	17.2.	Seminar work/project, written and oral presentation: pts	10
	17.3.	Activity and participation	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) (C)
		From 90 to 95 points	9 (nine) (B)
		from 95 to 100 points	10 (ten) (A)
19.	**Prerequisites for taking the final exam**	Minimum 11 pts from activities 17.1 and 17.2	
20.	**Language in which lectures are conducted**	English	
21.	**Method for monitoring the quality of lectures**	Anonymous student survey	
22.	**LITERATURE**		

22.1. Compulsory literature

No.	Author	Title	Publisher	Year
1.	King, M.	Process Control: A Practical Approach	John Wiley & Sons	2016
2.	Wightman, E. J.	Instrumentation in Process Control	Elsevier Science	2017

22.2. Additional literature

No.	Author	Title	Publisher	Year
1.	Dorf, R. C., Franklin, G. F., Bishop, R. H., Powell, J. D., Emami-Naeini, A.	Matlab & Simulink: Student version	Mathworks	2011
2.	Popov, E. P.	The Dynamics of Automatic Control Systems	Pergamon	2014
3.	Anderson, N. A.	Instrumentation for Process Measurement and Control, Third Editon	CRC Press	2017