

Add. 3		Course program for the first, second and third level (cycle) of studies			
1.	Course title	Hydraulic and Pneumatic components			
2.	Code	324			
3.	Study group(s)	PE, TML, TE, MJSE, IEM, MV, Mech			
4.	The organizer of the study program (unit, institute, department)	Faculty of Mechanical Engineering - Skopje, Ss. Cyril and Methodius University in Skopje			
5.	Level (first, second, third)	First			
6.	Academic year / semester	summer	7.	ECTS credits	6
8.	Instructor	prof. d-r Laze Trajkovski prof. d-r ZvonimiKostic			
9.	Prerequisites	Fluid Mechanics - signature			
10.	Course objectives (competences): Introduction to basic types, constructions and functional modes of volumetric machines (pumps and motors). Introduction to basic types of fluid components and their symbols. Classification, function, construction and implementation of fluid components. Pneumatic sensors. Dimensioning and selection of components in automation. Analysis of practical implementation of pneumatic and hydraulic systems.				
11.	Course content: Introduction. Selection of energy sources. Modern development of fluid technics and theory fundamentals. Fundamental laws in fluid technics. Hydraulic: inductivity, capacity and resistance. Calculation of suction height, hydraulic parameters and power of simple hydraulic circuits. Work fluids. Hydraulic pumps and motors, compressors and pneumatic motors. Hydraulic and pneumatic cylinders. Hydraulic and pneumatic distribution valves. Electro-hydraulic distribution valves. Proportional and servo controlled valves. Types, construction and functioning modes. Pressure valves, Types, construction and functioning modes. Regulation of rotation speed. Hydraulic accumulators - Types, construction, functioning modes, connection types and dimensioning. Other components: 2/2 logic valves, logic components, multipliers. Other equipment: reservoirs, coolers, filters, connectors. Circuits with fluid components. Symbols, Functioning modes. Selection of components. Analysis of practical implementation of pneumatic and hydraulic systems.				
12.	Study methods: Interactive teaching, laboratory and/or auditory exercises, standalone and/or team project work, standalone learning.				
13.	Total hours	6ECTSx30 classes = 180 hours			
14.	Hours allocation per activity:	30 + 30 + 25 + 20 + 75 = 180 hours			
15.	Lectures/Lab	15.1.	Lectures	30 hours	
		15.2.	Lab (student work)	30 hours	
16.	Project Work/Assignments	16.1.	Project assignments	25 hours	
		16.2.	Individual assignments	20 hours	
		16.3.	Self-study	75 hours	
17.	Points/Marks:				
	17.1.	Tests			80 points
	17.2.	Projects			10 points
	17.3.	Attendance			10 points
18.	Grading scale	Under 50		5 (five) (F)	
		51 - 60 points		6 (six) (E)	
		61 - 70 points		7 (seven) (D)	
		71 - 80 points		8 (eight) (C)	
		81 - 90 points		9 (nine) (B)	
		91 - 100 points		10 (ten) (A)	
19.	Prerequisites for taking the final exam	Classes attendance (min. 25%) and finished seminar assignments			
20.	Language of Instruction	Macedonian			
21.	Course evaluation	Student questionnaire			

22.	Textbooks				
22.1.	Instruction materials				
	No.	Author	Title	Publisher	Year
	1.	Laze Trajkovski	Fluid technics - hydraulics (internal script)	Faculty of Mechanical Engineering - Skopje	2007
	2.	Z. Kostic	Hydraulic machines and equipment (internal script)	Faculty of Mechanical Engineering - Skopje	1989
	3.	A. Nospal	Hydraulic Volumetric machines	Faculty of Mechanical Engineering - Skopje	2005
22.2.	Supplemental Instruction Materials				
	No.	Author	Title	Publisher	Year
	1.	T. M. Basta	Machine hydraulics	Faculty of Mechanical Engineering, Belgrade	1980