

Add. 3		Course program for the first, second and third level (cycle) of studies				
1.	Course title	Hydraulic machines				
2.	Code	325				
3.	Study group(s)	PE, TML, 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	winter	7.	ECTS credits	6	
8.	Instructor	prof. d-r Predrag Popovski				
9.	Prerequisites	Fluid mechanics - signature				
10.	Course objectives (competences): Study of the theoretical basics and principles of the design and operational characteristics of the turbomachines (pumps and turbines). Types of turbomachines and working conditions in systems. Ability to solve a simple practical problems in the selection of the type and characteristics of the hydraulic machines and theoretical basics for attending of higher courses.					
11.	Course content: Basic concepts and types of the hydraulic machines. Flow fundamentals and the energy exchange equation. Working characteristics of the turbomachines, equations of similarity, efficiency, cavitation and cavitation characteristics. Centrifugal and axial pumps, design characteristics, working performance and selection conditions. Hydraulic turbines, types, operating characteristics and selection conditions. Hydrostatic machines (piston pumps and ventricular pumps), design characteristics. Basics for installing the pumps and pump stations.					
12.	Study methods: interactive lectures, auditory practice and/or laboratory practice, self running and/or team work projects, self learning					
13.	Total hours	6 ECTS x 30 hours = 180 hours				
14.	Hours allocation per activity:	30 + 45 + 30 + 15 + 60 = 180 hours				
15.	Lectures/Lab	15.1.	Lectures	30 hours		
		15.2.	Lab (student work)	45 hours		
16.	Project Work/Assignments	16.1.	Project assignments	30 hours		
		16.2.	Individual assignments	15 hours		
		16.3.	Self-study	60 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					
20.	Language of Instruction					
21.	Course evaluation					
	Student questionnaire					
22.	Textbooks					
	22.1.	Instruction materials				
		No.	Author	Title	Publisher	Year

		1.	Поповски П.	Хидраулични Турбомашини	Печатени предавања	2009
		2.	Гајик А. Крсмановиќ Љ.	Основи турбомашина	Научна књига Белград	2006
		3.	Бабиќ М.	Збирка задатака из турбомашина	Научна књига Белград	2004
	22.2.	Supplemental Instruction Materials				
		No.	Author	Title	Publisher	Year
		1.	Ристиќ М.	Пумпе и пумпне станице	Научна књига Белград	2002
		2.	Радулов П.	Хидравлични машини	ТУ - Софија	2004