

Add. 3		Course program for the first, second and third level (cycle) of studies			
1.	Course title	Thermal machines and devices			
2.	Code	305			
3.	Study group(s)	PI,TML, HIMV, MSKI, IIM, MV, EE, MHT, AUS, DK			
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	Slave Armenski			
9.	Prerequisites	no			
10.	Course objectives (competences): Introduction to the elements of machines and devices for transformation of thermal energy (boiler plants, steam and gas turbines and internal combustion engines); direct application of thermal energy (heating and air conditioning units, cooling and drying); working fluids; thermal balance and thermal processes; coefficients of efficiency				
11.	Course content: ENERGY: Forms of energy and classification, energy sources, energy transformation and role of energy utilization. STEAM BOILER: Basic data, elements, function and classification. Fossil fuels and combustion. Thermal calculation of a single boiler unit. Heating surfaces of boiler plant. Types and designs of steam boilers. Equipments in the boiler room. STEAM TURBINES AND PLANTS: Concepts of design, principles of operation and classification. Thermal processes in the steam turbine stages. Internal and external heat losses in turbine stages. Efficiency coefficient. Coefficients of efficiency. Stationary and moving parts of the turbine. Steam turbine power plants. HEATING, VENTILATION AND COOLING: Calculation of heat losses. Systems for space heating; heating element: radiators, air gills, fan coils, floor heating. Air heating and ventilation systems. Cooling; refrigerants, compressor refrigeration machines, refrigerator, air heat pumps. INTERNAL COMBUSTION ENGINES: Construction and design of reciprocating engines. Four stroke piston engines. Parameters and type of reciprocating engines cycles. Stationary and moving parts of four stroke piston engines. Systems fuel mixture preparation. Ignition system. Cooling and lubrication systems.				
12.	Study methods: Interactive lectures, exercises auditory and / or laboratory, individual and / or team work project tasks, self-learning.				
13.	Total hours	6 ECTS x 30 = 180 hours			
14.	Hours allocation per activity:	30 + 30 + 30 + 30 + 60 = 180 hours			
15.	Lectures/Lab	15.1.	Lectures	30	
		15.2.	Lab (student work)	30	
16.	Project Work/Assignments	16.1.	Project assignments	30	
		16.2.	Individual assignments	30	
		16.3.	Self-study	60	
17.	Points/Marks:				
	17.1.	Tests			70 points
	17.2.	Projects			20 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	no			

20.	Language of Instruction	Macedonian language
21.	Course evaluation	Surveys and other forms of continuous evaluation

22.	Textbooks				
	Instruction materials				
	No.	Author	Title	Publisher	Year
22.1.	1.	Slave ARMENSKI	Thermal machines and devices	Alfa-94 Skopje	2010
	2.	Ilija Petrovski	Steam Boiler	University "Ss Cyril and Methodius" Skopje	2004
	3.	Mile Dimitrovski	Internal combustion engines, theory and modern equipment	University "Ss Cyril and Methodius" Skopje	2001
	Supplemental Instruction Materials				
22.2.	No.	Author	Title	Publisher	Year
	1.	Konstantin Dimitrov	Steam Turbines	Alfa-94 Skopje	2006
	2.	S. Zrnic, Z Culim	Heating and air conditioning, with solar energy utilization	Beograd	1991
	3	Ilija Cerepnalkovski	Cooling technique	University "Ss Cyril and Methodius" Skopje	1997