

Add. 3		Course program for the first, second and third level (cycle) of studies			
1.	Course title	Steam and Gas Turbine			
2.	Code	253			
3.	Study group(s)	TE (Thermal Engineering)			
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	4 / VII winter	7.	Number of ECTS credits	6
8.	Instructor	assoc. prof. PhD Done Tashevski			
9.	Prerequisites	Thermodynamics - passed			
10.	<p>Course objectives (competences): Introduction to the types, structure, thermal and constructive calculation, work in characteristic modes of steam and gas turbines and their basic parts. Candidates will be able to select the type of turbine, thermal and constructive calculation by selecting the required parameters and properties for the operation of steam and gas turbines and their parts.</p>				
11.	<p>Course content: FUNDAMENTALS. Purpose, separation, characteristics. THERMODYNAMIC AND STREAM FUNDAMENTALS. Basic stream and thermodynamic equations. Flowing through blades bars. Criteria for defining the shape of the nozzle. Effect of flow of the rotation blades. TURBINE THERMAL PROCESS. Expansion in the nozzles and rotation channels. Expansion through curved nozzles. Transformation of energy and basic dimensions of turbine blades. TURBINE ENERGY LOSSES. Internal losses (valves, static and rotation blades, friction and ventilation, humidity, output losses) and external losses. EFFICIENCY COEFFICIENT. Peripheral efficiency, internal thermal efficiency and opportunities his upgrading. Total (overall) efficiency. Power and fluid consumption in the turbine. THERMAL PROCESSES IN GAS TURBINE PLANTS. Isobar and isochoric. Opened and closed work process. Combustion chamber. Complex gas turbine plants and turboreaction gas turbine plants. Binary power plants. VARIABLE WORK MODES. Change of power in steam and gas turbines. Relationship between pressure and fluid flow. Basic principles for turbines regulation. CONSTRUCTION OF THE TURBINE PLANT. Construction of steam and gas turbines. Basic elements – static (casing, blades, diaphragms, bearings) and rotation (rotor, blades, clutches). AUXILIARY AND SAFETY SYSTEMS. Oil system. Turbine protection systems. RULES FOR EXPLOITATION AND MAINTENANCE. Commissioning, regular control, exploitation, stopping power, conservation and repair.</p>				
12.	Study methods: Teaching lectures, auditory/laboratory practice, self/team work, home studding				
13.	Total hours	6 ECTS x 30 hours = 180 hours			
14.	Hours allocation per activity:	30 + 30 +10 +10 +100 = 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	10 hours	
		16.2.	Individual assignments	10 hours	
		16.3.	Self-study	100 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	Realized activity 17.2. and 17.3.			
20.	Language of Instruction	Macedonian			
21.	Course evaluation	Student questionnaire			
22.	Textbooks				
	Instruction materials				
	No.	Author	Title	Publisher	Year
22.1.	1.	K. Dimitrov	Thermal turbines	MACEF	2005
	2.	S. Armenski, D. Tashevski	Thermal turbines - exercise	Alafa-94 Skopje	2009
	3.	Several authors	Water and steam diagrams/tables		
	Supplemental Instruction Materials				
22.2.	No.	Author	Title	Publisher	Year
	1.	Shlyahin	Gas and steam turbines	Energoizdat	1974
	2.	Scheglyayev	Steam turbines	Energoizdat	1978
	3.	H. Cohen	Gas turbine theory	Eddison Wesley	1996