Add. 3		Course program for the first, second and third level (cycle) of studies

1.	Course title	Non conventional energy sources			
2.	Code	225			
3.	Study group(s)	EE			
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 of renewable energy sources (solar, geothermal, biomass and wind) technologies and plants for their transformation into thermal, mechanical and electrical energy; working fluids; thermal cycles and processes, accumulation of energy; efficiency coefficient; equipment; environmental impact				
11.	Course content: ENERGY OF SOLAR RADIATION: technology was supplied to transform solar radiation into heat and efficiency of transformation. Systems for water heating, air heating and cooling; drying and seawater desalination. Systems for accumulation of solar radiation. GEOTHERMAL: Geothermal energy and geothermal sources. Direct application of geothermal sources for residential, commercial and industrial purposes: greenhouse production, district heating, drying, and aquaculture. Environmental impact. BIOENERGY: Biomass production and classification. Energy potential of biomass. Technologies for biomass transformation into liquid, gaseous and solid fuels. Power plants for biomass energy utilization: small and medium capacity power plants. WIND ENERGY: Transformation of wind energy into mechanical energy. Fundamental elements of wind turbine. Designing the blades of the wind turbine. Control and management systems. Cost-effectiveness, reliability and availability. Environmental impact.				
12.	Study methods: Interactive teaching, exercises, single-handed lessons				
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					
	22.1.	Instruction materials				
		No.	Author	Title	Publisher	Year
		1.	Slave ARMENSKI	Renewable –*Sustainable* Energy Sources	"EVROPA-92"-Kochani	2012
		2.	Slave ARMENSKI	Solar Energy-thermal transformation	"Jofi-sken"-Skopje	2012
		3.	Slave ARMENSKI	Biomass Energy	Alfa-94	2009
	22.2.	Supplemental Instruction Materials				
		No.	Author	Title	Publisher	Year
		1.	A.V da Rosa	Fundamentals of Renewable Energy Processes, 2nd Edition		2009
		2.	B. Sorensen	Renewable Energy, Its physics, engineering, use, environmental impacts, economy and planning aspects, Third Edition		2004
		3	H. Lund	Renewable Energy Systems, The Choice and Modeling of 100 % Renewable Solutions		2010