

Add. 3		Course program for the second level (second cycle - postgraduate) of studies			
1.	Course title	Environmental Measurement methods and Monitoring Systems			
2.	Code	1M5SEE05			
3.	Study group(s)	SEE			
4.	The organizer of the study program (unit, institute, department)	"Ss. Cyril and Methodius" University in Skopje, Faculty of Mechanical Engineering - Skopje			
5.	Level (first, second, third)	Second			
6.	Academic year / semester	V / winter	7.	ECTS credits	6
8.	Professor(s)	Prof. dr. Valentino Stojkovski Ass. Prof dr. Darko Babunski			
9.	Prerequisites	None			
10.	<p>Course objectives (competences):</p> <p>Learn to implement of the dimensional analysis and theory of similarity, to implement of the measurement instrumentation, accuracy of measurements, presentation of the results, Methods and instrumentation for the pressure, flow direction and velocity, discharge, temperature, movement, force and power.</p> <p>Data acquisition hardware &amp; software systems in environmental engineering</p> <p>Software packages for monitoring and control of environmental engineering processes.</p>				
11.	<p>Course content:</p> <p>Implementation dimensional analysis. Implementation the theory of similarity. Implementation of the measurement instrumentation. Accuracy of the measurements and presentation of the results. Pressure measurement. Measurement of the fluid flow direction and flow velocity. Discharge measurement. Temperature measurement. Measurement of concentration and particle size distribution of granular materials, force and power.</p> <p>Analysis of the advantages and disadvantages of continuous environmental monitoring. Comparison of sensors and instruments for continuous monitoring and field measurement. Analysis of the systems for continuous monitoring and control of environmental pollution. Monitoring of municipal and industrial wastewater. Measurement data analysis and techniques. Automatic monitoring stations for municipal and industrial wastewater.</p> <p>Air monitoring: air pollution monitoring and testing equipment, ambient air monitoring, and automatic air pollution monitoring systems.</p>				
12.	Study methods: lectures, lab, project assignments, individual assignments, self-study.				
13.	Total hours	6 ECTS x 30 = 180 hours			
14.	Hours allocation per activity:	30+15+40+30+65= 180 hours			
15.	Lectures/Lab	15.1.	Lectures (15 weeks x 2)	30 hours	
		15.2.	Lab (student work)	15 hours	
16.	Project Work/Assignments	16.1.	Project assignments	40 hours	
		16.2.	Individual assignments	30 hours	
		16.3.	Self-study	65 hours	
17.	Points/Marks:				
	17.1.	Exams			40

	17.2.	Projects		50		
	17.3.	Attendance		10		
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		Activity 16.1			
20.	Language		English			
21.	Course evaluation		Student questionnaire			
22.	Textbooks					
	22.1.	Instruction materials				
		No.	Author	Title	Publisher	Year
		1.	Randy D. Down, Jay H. Lehr	Environmental Instrumentation and Analysis Handbook	Wiley Interscience, Hoboken, NJ	2005
		2.	Doebelin E. O.:	Measurement Systems - Application and Design	McGraw-Hill, NY	2002
		3.	F. R. Bourden, D. Donnert, T. Godish, I. McKelvie	Environmental Monitoring Handbook	McGraw Hill	2004
	22.2.	Supplemental Instruction Materials				
		No.	Author	Title	Publisher	Year
		1.	G. Bruce Wiersma	Environmental Monitoring	CRC Press	2004
		2.	Janick Artiola, Ian Pepper, Mark Brusseau	Environmental Monitoring and Characterization	Elsevier Academic Press	2004