1.	Course title	**Modelling and simulation in networks**		
2.	Course code	KMET-I-05		
3.	Study program	**Computer networks and e-technologies**		
4.	Unit offering the course	**FCSE**		
5.	Undergraduate/master/PhD	**Master**		
6.	Year/semester 1(2)/winter/elective	7. ECTS: **6**		
8.	Teacher(s)	Prof. Ljupco Kocarev		
9.	Course prerequisites	None		
10.	Goals (competences): After successfully completing the course, the student is expected to be able to use techniques and tools to model systems for various types of simulations.			
11.	Course content: Understanding the need of modelling and simulation. Analytical methods for modelling, queuing models. Markov process modelling. Petri networks modelling. Combined models. Simulations. Basic terminology and concepts. Applying probability theory and statistics. Simulation techniques. Simulation tools. Statistical analysis of the obtained results. Student projects on analytical modelling and simulation methods.			
12.	Teaching methods: Lectures supported by slide presentations, interactive lectures, trainings (using lab equipment and software packages), team work, case studies, invited guests and lectures, individual practical assignments presentations, seminar paper, e-learning (forums, consultations).			
13.	Total available time	6 ECTS x 30 hours = 180 hours		
14.	Distribution of the available time	30 + 15 + 135 = 180 hours		
15.	Teaching activities	15.1.	Lectures	30 hours
		15.2.	Training (labs, problem solving), seminar and team work	15 hours
16.	Other activities	16.1.	Project work	60 hours
		16.2.	Self study	25 hours
		16.3.	Home work	50 hours
17.	Grading			
	17.1.	Tests		45 points
	17.2.	Seminar work/project (written or oral presentation)		45 points
	17.3.	Active participation		10 points
18.	Grading criteria		to 59 points	5 (five) (F)
			from 60 to 68 points	6 (six) (E)
			from 69 to 76 points	7 (seven) (D)
			from 77 to 84 points	8 (eight) (C)
			from 85 to 92 points	9 (nine) (B)

				from 93 to 100 points	10 (ten) (A)	
19.	Final exam prerequisites			Successfully completed activities 15.1 and 15.2		
20.	Course language			Macedonian and English		
21.	Quality assurance methods			Internal evaluation and student questionnaires		
22.	Literature					
	22.1.	Compulsory				
		No.	Authors	Title	Publisher	Year
		1.	G. Bolch, S. Greiner, H. de Meer, and K. Trivedi	Queueing Networks and Markov Chains: Modeling and Performance Evaluation with Computer Science Applications	John Wiley & Sons, New York	1998
		2.	C. Cassandras and S. Lafortune	Introduction to Discrete Event Systems	Kluwer Academic Publishers	1999
		3.	Philip Feldman	Discrete-Event Simulation for Performance Evaluation Systems With Algorithms and Example in C and C++	John Wiley & Sons	2000
	22.2.	Additional				
		No.	Authors	Title	Publisher	Year
		1.	Leonard Kleinrock	Queueing Systems, Vol 1 & 2	John Wiley & Sons, New York	1975
		2.				
		3.				