1.	Course title	**Embedded software for real-time critical applications**	
2.	Course code	SOCD-I-03	
3.	Study program	**System on Chip Design**	
4.	Unit offering the course	**FCSE**	
5.	Undergraduate/master/PhD	**Master**	
6.	Year/semester 1(2)/winter/elective	7. ECTS: **6**	
8.	Teacher(s)	Assoc. Prof. Dimitar Trajanov, Assoc. Prof. Vladimir Trajkovikj, Assist. Prof. Igor Mishkovski	
9.	Course prerequisites	None	
10.	Goals (competences): After successfully completing the course, the student is expected to be able to build physical systems with real-time constraints using integration of the computing and communication with the physical process. The student will be able to monitor and control physical processes in real time using embedded systems.		
11.	Course content: Design principles, methods and techniques for highly reliable physical systems. Modelling, mental models, qualitative analysis, risk assessment. Real-time programming and communication, real-time scheduling and virtual machines. Programming with time constraints. Fast reconfiguration. Computer system feedback. Verification and validation and proof-based certification. Formal specification and analysis methods. Model based testing. Security critical embedded systems design. (*i.e. Pacemaker, infusion pumps)*.		
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		40 points
	17.2.	Seminar work/project (written or oral presentation)		45 points
	17.3.	Active participation		15 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	

	Literature					
22.	22.1.	Compulsory				
		No.	Authors	Title	Publisher	Year
		1.	Hermann Kopetz	Real-Time Systems: Design Principles for Distributed Embedded Applications	Kluwer Academic Publishers	1997
		2.	Insup Lee, Joseph Y-T. Leung and Sang Son	Handbook of Real-Time and Embedded Systems	CRC Press, Boca Raton, FL., U.S.A.,	2007
		3.	Edward Lee , Snajit Sheshia	Introduction to Embedded Systems: A Cyber-Physical Systems Approach	ISBN 978-0-557-70857-4,UC Berkeley.	2011
	22.2.	Additional				
		No.	Authors	Title	Publisher	Year
		1.		Selected papers		
		2.				
		3.				