1.	Course		*Mathematic biology*	
2.	Code		KNI_E4	
3.	Study programme		Computer Science and Engineering PhD study programme	
4.	Study programme organized by		FCSE	
5.	Cycle		Third – PhD	
6.	Academic year / semester winter/summer/elective		7. ECTS credits 7,5	
8.	Teacher		Prof. d-r Ljupcho Kocarev	
9.	Prerequisites		None	
10.	Course programme goals (competences): Enabling the students to apply and develop mathematical models in biology and medicine. The student will have knowledge needed to interpret and apply mathematical models for biological phenomena in the real world.			
11.	Course syllabus: In this course the development and applicability of mathematical models in biology and medicine will be studied. The course topics include: computational modeling in biology and medicine, neuron models, biochemical and oscillatory networks, cancer modeling, neural and genetic networks, metabolic-replication systems, automata theory, cellular automata, chaos systems in biology and population biology. The course will present various applications of statistics and calculus in order to quantify the natural sciences phenomena, but above all it will introduce a new point of view on the complex living organisms by information organization and identification and study of biological structures. The main course goal is to develop mathematical models for biological processes. Thus, it is expected that the students will interpret and work with mathematical models, as well as apply them for solving real life phenomena on qualitative level.			
12.	Teaching methods: Classes supported with slide presentations, interactive teaching, lab equipment and other software packages, teamwork, case studies, invited guest lecturers, presentations of project works, e-learning materials, forums and consultations.			
13.	Total fund of work hours		7,5 EKTC x 30 h = 225 h	
14.	Available hours distribution		45+30+150 = 225	
15.	Teaching activities	15.1.	Theoretical classes	45 h
		15.2.	Practical classes (labs, exercises), seminars, team work	30 h
16.	Other activities	16.1.	Project tasks	50 h
		16.2.	Self study	50 h
		16.3.	Homework	50 h
17.	Grading			
	17.1.	Tests		40 points
	17.2.	Seminar work/ project (presentation: written and oral)		50 points
	17.3.	Active participation		10 points
18.	Grading criteria (points/grade)		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.	Conditions for attending the final exam		Successful completion of activities 15.1 and 15.2		
20.	Language		Macedonian or English		
21.	Quality assessment		Internal evaluation and student pools		
22.	Literature				
	22.1.	Compulsory			
		No.	Author	Title	Publisher	Year
		1.	J.D. Murray	Mathematical Biology in 2 volumes: Mathematical Biology: I. An Introduction	Springer-Verlag	2002
		2.	J.D. Murray	Mathematical Biology: II. Spatial Models and Biomedical Applications	Springer-Verlag	2003
		3.	S.H. Strogatz	Nonlinear dynamics and Chaos: Applications to Physics, Biology, Chemistry, and Engineering	Perseus	2001
	22.2.	Additional				
		No.	Author	Title	Publisher	Year
		1.	U. Alon	An introduction to Systems Biology: Design Principles of Biological Circuits	Chapman & Hall/CRC	2006
		2.				
		3.				