

1.	Course title	Mathematical biology		
2.	Course code	BIO-I-02		
3.	Study program	Master studies in Information Science and Computer Engineering, module Bioinformatics		
4.	Unit offering the course	FCSE		
5.	Undergraduate/master/PhD	Master		
6.	Year/semester 1/winter/elective	7. ECTS: 6		
8.	Teacher(s)	Ph.D. Ljupco Kocarev		
9.	Course prerequisites	None		
10.	Goals (competences): The student will be able to use mathematical models over different biological models.			
11.	Course content: Population models of one specie: continual models, discrete models, stability and bifurcation analysis. Population models of more species: predator-prey, Lotka-Volterra systems. Competitive models. Reaction kinetics: basic enzymes reaction. Autocatalysis, activation and inhibition. Biological oscillators and inhibitors: short history, motivation, control mechanisms with feedback. Oscillators and inhibitors with two and more species. Hodgkin-Huxley theory for neural membranes, FitzHugh-Nagumo model. BZ reactions. Perturbed and connected oscillators. Dynamics of infective diseases. Diffuse reactions and nonlocal mechanisms. Biological waves.			
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	100 + 0 + 80 = 180 hours		
15.	Teaching activities	15.1.	Lectures	100 hours
		15.2.	Training (labs, problem solving), seminar and team work	0 hours
16.	Other activities	16.1.	Project work	20 hours
		16.2.	Self study	20 hours
		16.3.	Home work	30 hours
17.	Grading			
	17.1.	Tests		65 points
	17.2.	Seminar work/project (written or oral presentation)		25 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.	J.D. Murray	Mathematical Biology: I. An Introduction	Springer-Verlag, 3rd ed. in 2 vols.	2002
		2.	L. Edelstein-Keshet	Mathematical Models in Biology	SIAM	2004
	3.	S.H. Strogatz	Nonlinear dynamics and Chaos: Applications to Physics, Biology, Chemistry, and Engineering	Perseus	2001	
	22.2.	Additional				
		No.	Authors	Title	Publisher	Year
		1.				
		2.				
3.						