1.	Course title	Programming languages and software tools in bioinformatics		
2.	Course code	BIO-I-04		
3.	Study program	**Bioinformatics**		
4.	Unit offering the course	**FCSE**		
5.	Undergraduate/master/PhD	**Master**		
6.	Year/semester 1/winter/elective	7. ECTS: **6**		
8.	Teacher(s)	professor Vladimir Trajkovic associate professor Andrea Kulakov		
9.	Course prerequisites	None		
10.	Goals (competences): The student will be able to use scripting and programming languages, as well as simulation tools applicable to solve bioinformatics and system biology problems.			
11.	Course content: Introduction to programming applicable to bioinformatics with focus on script programming languages: Pert and Python. Pattern based Pert Programming, Bio-Pert Application Programming Interface. String manipulations using Python: Arrays, vocabularies. Bio-Python Application Programming Interface. Introduction to tools for modelling and simulation applicable to bio-informatics and system biology with main focus on MatLab. SBML: System Biology Modelling Language.			
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	120 + 0 + 60 = 180 hours		
15.	Teaching activities	15.1.	Lectures	90 hours
		15.2.	Training (labs, problem solving), seminar and team work	0 hours
16.	Other activities	16.1.	Project work	15 hours
		16.2.	Self study	15 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.	James Tisdall	Beginning Perl for Bioinformatics	O'Reilly Media	2001
2.	M. L. Model, James Tisdall	Bioinformatics Programming with Python	O'Reilly Media	2009
3.	The MathWorks, Inc.	Bioinformatics Toolbox User's Guide	The MathWorks, Inc.	2009

22.2. Additional

No.	Authors	Title	Publisher	Year
1.	The MathWorks, Inc.	SimBiology User's Guide	The MathWorks, Inc.	2009
2.				
3.				