1.	Course title	Advanced matemathical and statistical techniques
2.	Course code	БИО-3-03
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/summer/compulsory	7. ECTS: **6**
8.	Teacher(s)	Ph.D. Ljupco Kocarev, Ph.D. Zaneta Poposka
9.	Course prerequisites	None
10.	Goals (competences): The student will be capable to use different mathematical techniques for modelling and analysis of biological systems.	
11.	Course content: This subject includes the methods of statistical interference and stochastical modelling with application on functional genomics and computational molecular biology. Computations are performed using data from the biological data bases. The structure of the subject is: statistical theory for analysis of sequences and searching in data bases, Markov models and hidden Markov models, elements from Bayes and similarity interference, discrete data models, linear regression analysis, methods for multivariate data analysis (PCA, clustering), software tools for statistical calculations.	
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

		Literature				
22.	22.1.	Compulsory				
		No.	Authors	Title	Publisher	Year
		1.	Morris H. DeGroot, Mark J. Schervish	Probability and Statistics	Addison Wesley, 3 edition	2001
		2.	Warren J. Ewens, Gregory Grant	Statistical Methods in Bioinformatics: An Introduction (Statistics for Biology and Health)	Springer; 2 edition	2005
		3.	Laxmi Parida	Pattern Discovery in Bioinformatics: Theory & Algorithms	Chapman & Hall/CRC, 1 edition	2007
	22.2.	Additional				
		No.	Authors	Title	Publisher	Year
		1.				
		2.				
		3.				