

1.	Course	Statistical learning theory			
2.	Code	INF-S23			
3.	Study programme	Informatics			
4.	Study programme organized by	Faculty of Computer Science and Engineering			
5.	Cycle	Third - PhD			
6.	Academic year / semester winter/summer/elective	first/second	7.	ECTS credits	7.5
8.	Teacher	Prof. D-r Zaneta Popeska			
9.	Prerequisites	None			
10.	Course programme goals (competences): The goal of the course is to enable students to learn the major probability and computational methods for statistical modeling of complex multidimensional data. The accent will be on graphical models since they are powerful tools in getting inside of statistical dependences. The focus will be given on theoretical and methodological principles of statistical inference.				
11.	Course syllabus: Introduction to graphical models. Directed and undirected graphical models. Conditional independence. Statistical inference: elimination algorithms. Sum-product algorithm. Factor graphs. Estimation and parameterization: Bayesian, maximum likelihood and maximum a posteriori estimation. Linear regression. Linear classification. Exponential families, sufficient statistics. Examples: Hidden Markov models, factor analysis, Kalman filter. General algorithms for inference. Connecting trees, approximated inference, sampling methods, variation methods.				
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 ECTS 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	40 h	
16.	Other activities	16.1.	Project tasks	30 h	
		16.2.	Self study	30 h	
		16.3.	Homework	80 h	
17.	Grading				
	17.1.	Tests			60 points
	17.2.	Seminar work/ project (presentation: written and oral)			40 points
	17.3.	Active participation			0 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.	S. Lauritzen	Graphical models,	Oxford University Press	1996
	2.	J. Whittaker	Graphical Models in Applied Multivariate Statistics	MIT Press	2004
3.	N. Cressie	Statistics for Spatial Data	Wiley, NY	1993	
22.2.	Additional				
	No.	Author	Title	Publisher	Year
	1.	S. Banerjee, B.P. Carlin and A.E. Gelfand	Hierarchical Modeling and Analysis for Spatial Data	Chapman and Hall/CRC Press	2004
	2.	Vladimir N. Vapnik	Statistical Learning Theory	Wiley	1998