1.	Course title	**Pattern recognition**		
2.	Course code	SI-I-11		
3.	Study program	**Master Studies in Computer Science and Engineering - Software engineering**		
4.	Unit offering the course	**FCSE**		
5.	Undergraduate/master/PhD	**Master**		
6.	Year/semester 1(2)/summer/elective	7. ECTS: **6**		
8.	Teacher(s)	assoc. prof. dr. Dejan Gjorgjevikj, assist. prof. dr. Gjorgji Madjarov		
9.	Course prerequisites	None		
10.	Goals (competences): To introduce the students to the modern techniques of pattern recognition and classification. Upon completion the course the students are expected: to have deepened knowledge of the advanced techniques and methodologies of pattern recognition; to be able to understand, analyse and formulate general problems of pattern recognition; to successfully apply algorithms for pattern analysis and recognition in real world problems; to be able to conceptualize, analyse, realize and estimate the performance of a pattern recognition system.			
11.	Course content: Machine perception, Statistical decision theory, Bayesian decision theory, Optimal decisions, classification, probability density functions, dimensionality, capacity, model selection, training, evaluation, complexity; Parameter Learning, Basic statistical techniques, bias and variance, density estimation, regression, discriminant analysis. Nonparametric techniques, nearest neighbour classification methods, flexible metrics; Linear discriminant functions, Fisher classifier, Artificial neural networks, support vector machines; Nonmetric methods, decision trees; Markov chain, Applications of Hidden Markov Models; the use of context in pattern recognition; Stochastic models, Genetic algorithms; Error estimation, empirical error criterion, confidence intervals; Feature extraction, Principal Component Analysis, feature subset selection; Bagging, boosting, classifier combining; Design, analysis, implementation and application of algorithms in pattern recognition. Practical usage examples: OCR, script recognition, speech recognition; Scene analysis, robot vision.			
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	60 + 0 + 120 = 180 hours		
15.	Teaching activities	15.1.	Lectures	60 hours
		15.2.	Training (labs, problem solving), seminar and team work	0 hours
16.	Other activities	16.1.	Project work	45 hours

		16.2.	Self study	45 hours
		16.3.	Home work	30 hours

17.	Grading		
	17.1.	Tests	45 points
	17.2.	Seminar work/project (written or oral presentation)	45 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.	Richard O. Duda, Peter E. Hart and David G. Stork	Pattern Classification (2nd ed.)	Wiley-Interscience	2000
2.	Christopher M. Bishop	Neural Networks for Pattern Recognition	Oxford University Press	1995
3.	Andrew R. Webb	Statistical Pattern Recognition	Willey	1999

22.2. Additional

No.	Authors	Title	Publisher	Year
1.				
2.				
3.				