

1.	Course title	<b>Time series analysis and forecasting</b>		
2.	Course code	SI-I-06		
3.	Study program	<b>Master Studies in Computer Science and Engineering - Software engineering</b>		
4.	Unit offering the course	<b>FCSE</b>		
5.	Undergraduate/master/PhD	<b>Master</b>		
6.	Year/semester 2/ winter/elective	7. ECTS: <b>6</b>		
8.	Teacher(s)	assist. prof. dr. Gjorgji Madjarov, assoc. prof. dr. Dejan Gjorgjevikj		
9.	Course prerequisites	None		
10.	Goals (competences): To introduce the students with statistical methods of machine learning for time series analysis and forecasting with primary focus on financial data. Upon completion the course, the students are expected: to have deepened knowledge of the advanced techniques and methodologies of time series analysis and forecasting time series patterns; to be able to understand, analyse and model real world time series problems; to be able to conceptualize, realize and estimate the performance of systems for time series analysis and forecasting.			
11.	Course content: Linear time series analysis, autocorrelated data analysis, stationary and non-stationary models, models with transfer functions, Box-Jenkins models (autoregressive, moving average, and autoregressive moving average models), analysis of seasonality and trend detection, volatility models, forecasting evaluation and diagnostics checking. Machine learning techniques for time series prediction based on decision trees, ensembles, linear regression, neural networks. The course will emphasize applications to financial data, volatility modeling and risk management.			
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	30 hours
		16.2.	Self study	50 hours
		16.3.	Home work	40 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.	By Douglas C. Montgomery, Cheryl L. Jennings, Murat Kulahci	Introduction to Time Series Analysis and Forecasting	John Wiley & Sons, Inc.	2008
		2.	George E. P. Box, Gwilym M. Jenkins, Gregory C. Reinsel	Time Series Analysis: Forecasting and Control, 4th Edition	John Wiley & Sons, Inc.	2008
		3.	Søren Bisgaard and Murat Kulahci	Time Series Analysis and Forecasting by Example	John Wiley & Sons, Inc.	2011
		Additional				
		No.	Authors	Title	Publisher	Year
	22.2.	1.				
	2.					
3.						