

COURSE NAME		Complex networks analysis			
Code	PMM502	Year of study	2st graduate study, Statistical		
Course teacher	Tanja Vojković	Credits (ECTS)	6		
Associate teachers		Type of instruction (number of hours)	L	S	E
			30		30
Status of the course	Compulsory course	Percentage of application of e-learning	30%		
COURSE DESCRIPTION					
Course objectives	The objective of this course is to introduce students to new and fast growing field of complex networks. Mathematically, complex network is a graph, so concepts and results from graph theory are largely used. Students will learn about basic notions of networks and their analysis through lectures and through auditory excercises and homeworks they will pratice tools for analysis, vertex centrality measures, imoportant edges and paths, community detection and epidemic models.				
Course enrolment requirements and entry competences required for the course	Graph theory course and Data structure and algorithms course must be passed, and knowledge of basic algorith complexity is preferable.				
Learning outcomes expected at the level of the course (4 to 10 learning outcomes)	<p>Students will be able to:</p> <ul style="list-style-type: none"> <li>- explain the importance of complex networks and motivation for their analysis</li> <li>- explain basic measures for structure of complex networks</li> <li>- implement basic algorithms for analysis</li> <li>- explain the process and methods of community detection and know basic algorithms for community detection</li> <li>- talk about models of epidemic spread</li> </ul>				
Course content broken down in detail by weekly class schedule (syllabus)	<ul style="list-style-type: none"> <li>- Introduction to complex networks, types and properties, classification – 2 hours</li> <li>- Network representation, Laplacian, eigenvalues – 2 hours</li> <li>- Measures and metrices (centrality)– 2 hours</li> <li>- Groups of vertices (cliques, cores, components, transitivity, clustering) – 4 hours</li> <li>- Substructures (communities, components) – 3 hours</li> <li>- Basic algorithms on networks – 5 hours</li> <li>- Complex algorithms on networks – 5 hours</li> <li>- Processes on networks (epidemics, SI, SIR, SIRS) – 5 hours</li> </ul>				
Format of instruction	Lectures, exercises.				
Student responsibilities	Attendance and homework				

Screening student work ( <i>name the proportion of ECTS credits for each activity so that the total number of ECTS credits is equal to the ECTS value of the course</i> )	Attendance – 1 ECTS Colloquium – 1 ECTS Oral exam – 2 ECTS Homework – 2 ECTS
Grading and evaluating student work in class and at the final exam	The exam which requires solving practical and theoretical through homework and an oral theoretical exam. Passed homework is a prerequisite for the oral exam.
Required literature (available in the library and via other media)	1. M.E.J. Newman: Networks, An Introduction, Oxford University Press, London, 2010.
Optional literature (at the time of submission of study programme proposal)	D. Veljan: Kombinatorna i diskretna matematika A. Golemac: Teorija grafova, skripta
Quality assurance methods that ensure the acquisition of exit competences	Statistics of test results and student evaluation via anonymous questionnaires at the end of the course. The survey is conducted according to the rules of the University of Split.
Other (as the proposer wishes to add)	