COURSE TITLE	GRAPH ALGORITHMS					
Course code	DPR005	Year of study	1			
Lecturer(s)	Ljiljana Despalatović, senior lecturer	ECTS (Number of credits allocated)	6			
Associates		Total lesson hours per semester	Lecture	Seminar	Practical	Laboratory
			24	16		20
Course status	Core	Percentage share of e-learning	50.00%			

COURSE DESCRIPTION

Course Objectives	The goal of the course is to acquire knowledge in graph theory, to model discrete problems using graphs, and to apply appropriate methods for their solution, as well as to determine the complexity of algorithms. It involves distinguishing between problems that can be solved in polynomial time and hard problems (NP-complete).
Course enrolment requirements and entry competencies required for the course	Good knowledge of programming in at least one programming language.
Learning outcomes On successful completion of this course, student should be able to:	1. Explain the basic graph algorithms and analyze them. 2. Use graphs and networks to model problems. 3. Estimate the complexity of problems and algorithms in graph theory and complex networks. 4. Identify problems as optimization problems. Distinguish between exact and heuristic methods. 5. Apply well-known algorithms from the field of graphs and complex networks. 6. Create new algorithms that utilize graph algorithms as their building blocks, implement them, and analyze them.
Course content	Introduction and Motivation. Python Programming Language, advanced concepts. Algorithm complexity. Terms P, NP, NP-hard, NP-complete. Definitions, representation, properties, and types of graphs. Walk, path, cycle, tree. Handshake lemma, Eulerian tour. Hamiltonian cycle, shortest path. Graph traversal. Components in a graph. Connectivity and connected components. Cut edge. Algorithms for finding the shortest path and all shortest paths in a graph. Minimum spanning tree. Prim's and Kruskal's algorithms. Cliques in a graph. Complex networks. Centrality, betweenness of vertices and edges.
Types of teaching:	☒ lecture ☒ seminars and workshop ☒ practical ☐ combined e-learning ☐ field research ☒ self-study ☐ multimedia ☐ laboratory ☒ mentoring work ☐ (others)
Student obligations	Attending classes, seminar, exams.

Monitoring student work (enter the share in ECTS						
	Class attendance	0.8	Research		Practical work	0.67
	Experimental work		Report		(others)	

credits for each activity so that the total number of ECTS credits	Essay		Seminar	0,53	(others)	
	Self-study	2	Workshop		(others)	
	Project	2	Office hours, mid-term exams and final exam	0	(others)	

Assessment and evaluation of student work during classes and at the final exam

CONTINUOUS ASSESSMENT		
Continuous testing indicators	Performance A_i (%)	Grade ratio k_i (%)
Class attendance	50-100	100

FINAL ASSESSMENT		
Indicators checks (first and second final exam terms)	Performance A_i (%)	Grade ratio k_i (%)
Practical exam	50 - 100	60
Project	50 - 100	30
Previous activities	50 - 100	10

The grade (in percentages) is formed on the basis of all indicators that describe the level of student activities according to the relation:

$$Grade\,(\%) = \sum_{i=1}^{N} k_i A_i$$

k_i - weighting factor for each activity,
A_i - success in percentage achieved for a particular activity,
N - total number of activities.

PERFORMANCE AND GRADE		
Percentage	Criteria	Grade
50% - 61%	basic criteria met	sufficient (2)
62% - 74%	average performance with some errors	good (3)
75% - 87%	above average performance with minor errors	very good (4)
88% - 100%	outstanding performance	outstanding (5)

Required reading	

Optional reading	1. Magnus Lie Hetland “Python Algorithms”, Apress, 2010. 2. Amy E. Hodler & Mark Needham „Graph Algorithms”, O'Reilly, 2019.
Quality monitoring to ensure the acquisition of established learning outcomes	• Records of class attendance and success in performing student obligations • Updating detailed course curricula • Supervision of teaching activities • Continuous quality control of all parameters of the teaching process in accordance with the Action Plans • Semester-based student survey in accordance with the "Ordinance on the procedure of student evaluation of teaching work at the University of Split" (UNIST, Centre for Quality Improvement).
Other information	