

Incoming student mobility

UNIOS University Unit: DEPARTMENT OF MATHEMATICS

COURSES OFFERED IN FOREIGN LANGUAGE
FOR ERASMUS+ INDIVIDUAL INCOMING STUDENTS

Department or Chair within the UNIOS Unit	Department of Mathematics
Study program	Graduate university study programme in mathematics (Master level) Branches: <ul style="list-style-type: none"> Mathematics and Computer Science-elective
Study level	Graduate (master)
Course title	Complex Networks
Course code (if any)	MI007
Language of instruction	English
Brief course description	<p>Syllabus.</p> <ol style="list-style-type: none"> 1. Introduction. Complex networks: definition and basic properties. Examples of complex networks in computer science, physics, chemistry, biology, sociology. 2. Graph theory: basic terms. Directed and undirected graphs. Weighted graphs. Degree of a graph. Subgraph. Path. Cycle. Connectivity and distance in graphs. Random walk. Graph representation. Matrices associated to graphs. Bipartite graphs and trees. Eulerian and Hamiltonian graphs. Graph coloring. Planar graphs. Transportation networks. 3. Centrality measures in complex networks. Degree centrality. Eigenvector centrality. Katz centrality. PageRank centrality. Distance based measures of centrality. Betweenness centrality. Subgraph centrality. 4. The structure of complex networks. Connected components. Shortest paths and the small-world property. Degree distribution. 'Power-law' distribution and hubs. Clustering coefficient. Homophily and assortativity. 5. Models of complex networks. Erdős – Rényi model. Configuration model. Small - world network model. Scale – free network model. Random geometric networks. 6. Partitioning of complex networks. Kernighan – Lin method.

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	<p>Spectral partitioning methods that use Laplace and modularity matrix. Partitioning methods based on vertex betweenness. Hierarchical methods.</p> <p>7. Dynamical processes in complex networks. Percolation. Molloy – Reed criterion. Epidemic and rumor spreading. Network robustness.</p>
Form of teaching	Consultative teaching.
Form of assessment	Lectures and exercises are obligatory. The exam consists of a written and an oral part. Upon completion of the course, students can take the exam. Successful midterm exam scores replace the written exam. Exercises are both auditory and laboratory. Laboratory exercises include the usage of computers. Students can improve their grades by writing homework assignments and seminars.
Number of ECTS	6
Class hours per week	2+2+0
Minimum number of students	
Period of realization	Summer semester
Lecturer	Snježana Majstorović