

DOCTORAL (PHD) STUDIES
COURSE UNIT DESCRIPTION

Course unit title	Scientific areas	Faculty	Institute, department
Network models and algorithms	Informatics (N 009)	Faculty of Mathematics and Informatics	Institute of Computer Science, Department of mathematical computer science

Study method	Number of credits	Study method	Number of credits
Lectures	1 (autumn semester)	Consultations	
Individual works	5	Seminars	1 (autumn semester)

Summary
<p>The subject of the course is the network data analysis. The network data describes relations of various nature between actors, it provides important information about the actors in addition to the numerical, categorical and other attribute characteristics of the actors. Geometrical features of network data are depicted by graph, while statistical properties of such features are modelled by random graphs. Algorithms aimed to analyse network data are designed in accordance with the geometrical features: often we need different algorithms for different graph families.</p> <p>Theoretical lectures and seminars discuss the following topics: (1) theoretical network models: binomial, inhomogeneous, configuration, geometric, intersection random graphs and multiplex networks, networks evolving in time; (2) geometrical characteristics of theoretical models: edge density, birth/containment of a subgraph, degree distribution, component evolution; (3) complex network characteristics: power law degree, clustering coefficient, small world phenomenon; (4) selected problems and algorithms: clustering and community detection, random walk and data collection, link prediction.</p> <p>Individual work is aimed at theoretical problem solving, literature studies, computer analysis of real and simulated data (assignments).</p>
Main literature
M.E.J. Newman. <i>Networks. An Introduction</i> . Oxford university press. New York. 2010.
J. Kleinberg, É. Tardos. <i>Algorithm Design</i> . Addison Wesley 2005.
D. Easley, J. Kleinberg. <i>Networks, Crowds, and Markets: Reasoning about a Highly Connected World</i> . Cambridge University Press. New York. 2010.
A. Frieze, M. Karonski. <i>Introduction to Random Graphs</i> . Cambridge University Press. 2015.

Lecturer(s) (name, surname)	Science degree	Main publications
Mindaugas Bloznelis	Habil. Dr.	http://www.elaba.mb.vu.lt/mif/?aut=Mindaugas+Bloznelis