DOCTORAL (PHD) STUDIES

COURSE UNIT DESCRIPTION

Course unit title	Scientific areas	Faculty	Institute, department
Model-driven systems engineering	Informatics Engineering (T 007)	Faculty of Mathematics and Informatics	Institute of Data Science and Digital Technologies

Study method	Number of credits	Study method	Number of credits
Lectures	1	Consultations	1
Individual works	4	Seminars	1

Summary
Necessary preparation. The module's studies require knowledge of the master's level computer science and mathematics courses offered to the students of informatics specialties.

The aim of the course is to deepen knowledge of model-based development of cybersocial systems (enterprise information systems).

Main topics: life cycle of systems development, RUP model, J. Zachman ISA framework. OMG MDA Approach. MDE, MDD, MBSE methodologies.

MDA / MDE Approach: Layers CIM, PIM, and PSM. Modeling at CIM layer. PIM layer creation. PSM layer compilation. Content separation in the MDA frameworks. Transformation CIM - PIM: Transformation Rules. BPMN, DMN and UML application. QVT (Query / View / Transformation). Atlas Transformation Language (ATL). Transformation PIM - PSM: Transformation Rules, UML Application. Transformation PSM - Code. Model transformation by MDA packages. Complex MDA process process.

MBSE mathematical fundamentals. MBSE applications: IBM Telelogic Harmony-SE. Application packages that implement MDA and MBSE. MBSE realization of complex systems of architectural frameworks MODAF. Domain knowledge based IS design. Integration of the domain knowledge model into the MDA framework.

Modified MDA schema with layer of Domain knowledge models. Creating a domain causal model. Relationship between the Domain knowledge layer and the CIM layer.

Practical tasks: report on model-based systems engineering methods and program packages, the specific topic of the report is combined with the subject of the dissertation.

Main literature
OMG MDA™ Guide revision 2.0, 2014 http://www.omg.org/cgi-bin/doc?ormsc/14-06-01
A. Solberg, D. Simmonds, R. Reddy, S. Ghosh, R. France, "Using Aspect Oriented Technologies to Support Separation of Concerns in Model Driven Development", Accepted in the 29th Annual International Computer Software and Applications Conference (COMPSAC 2005), Edinburgh, Scotland, July, 2005
Gudas, S.; Valatavičius, A. Extending model-driven development process with causal modeling approach // Data science: new issues, challenges and applications / Dzemyda, Gintautas, Bernatavičienė, Jolita, Kacprzyk, Janusz (Eds.). Cham: Springer, 2020. ISBN 9783030392499. eISBN 9783030392505. p. 111-143. (Studies in Computational Intelligence, ISSN 1860-949X, eISSN 1860-9503 ; vol. 869). DOI: 10.1007/978-3-030-39250-5_7.
Saulius Gudas (2012). Foundations of the Information Systems Engineering Theory. Monograph, Vilnius, Vilniaus universiteto leidykla, 2012, 382 p. ISBN978-609-459-075-7
Patrice Micouin, Model Based Systems Engineering: Fundamentals and Methods, 2014.
Model Driven Architecture – Foundations and Applications. 4th European Conference, ECMDA-FA 2008 Berlin, Germany, June 9-13, 2008 Proceedings, Springer.
Ramos, Ana Luísa, José Vasconcelos Ferreira, and Jaume Barceló. "Ramos, Ana Luísa, José Vasconcelos Ferreira, and Jaume Barceló. "Model-based systems engineering: An emerging approach

for modern systems." Systems, Man, and Cybernetics, Part C: Applications and Reviews, IEEE Transactions on 42.1 (2012): 101-11
Estefan, Jeff A. "Survey of model-based systems engineering (MBSE) methodologies." Incose MBSE Focus Group 25 (2007): 8.
Thomas O. Meservy Kurt D. Fenstermacher Transforming Software Development: An MDA Road Map. Computer, 2005

Lecturer(s) (name, surname)	Science degree	Main publications
Saulius Gudas	Dr.	http://www.elaba.mb.vu.lt/dmsti/?aut=Saulius+Gudas
Audrius Lopata	Dr.	https://www.researchgate.net/profile/Audrius-Lopata/research
Audronė Lupeikienė	Dr.	http://www.elaba.mb.vu.lt/dmsti/?aut=Audronė+Lupeikienė