

DOCTORAL (PHD) STUDIES COURSE UNIT DESCRIPTION

Course unit title	Scientific areas	Faculty	Institute, department
Requirements Engineering Methods and Techniques	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
Semester: autumn			

Summary
The course presents a holistic approach to requirements engineering, discussing its fundamentals, principles, paradigms, and techniques. It examines methods and languages for specifying modern computer systems of various types (including large-scale complex systems and system families) and their interactions, highlighting the use of artificial intelligence methods. It also covers business analysis, standards, the interrelationship between requirements engineering and other system development processes, issues of quality assurance and documentation, and requirements management tools. <i>Main topics:</i> • Methodological foundations of requirements engineering. • Modelling principles, requirements modelling. • Standards and languages for requirements analysis and specification. • Requirements modelling paradigms. • Business analysis. • Goal- and scenario-based requirements engineering paradigms. • Ecosystem of languages and tools for model-based systems engineering and requirements formulation. • Mastering requirements specifications within the context of architectural frameworks (DoDAF, TOGAF, UAF). • User-centred paradigm and specification of system interactions. • Analysis and specification of different system types (cyber-social, cyber-physical, agent-based, product lines). • Quality assurance for requirements specification: methods and techniques. • Documenting requirements, document templates. • Knowledge-based requirements engineering and the use of artificial intelligence methods. <i>Practical tasks:</i> the doctoral student must prepare a specification and submit project documentation (covering the specific requirements engineering methods applied, the modelling paradigm, the modelling language, and the requirements management system or tool). The content of the practical task is aligned with the topic of the dissertation. <i>Assessment:</i> 1. presentations at the seminar, 2. system requirements specification, 3. justification of the chosen solutions.
Main bibliography
K. Pohl (2025) Requirements Engineering. Fundamentals, Principles, and Techniques. Springer Berlin, Heidelberg, 2nd ed., 907 p., ISBN 978-3-662-69204-2.
E. Hull, K. Jackson, J. Dick (2011) Requirements Engineering. 3rd ed., Springer, 207 p., ISBN 978-1849964043.
A. P. Laplante (2009) Requirements Engineering for Software and Systems. CRC Press, 241 p., ISBN 978-1-4200-6467-4.

M. A. Jackson (2000) Problem Frames: Analysing and Structuring Software Development Problems. Addison – Wesley, 416 p., ISBN 978-0201596274.
P. Clements, L. M. Northrop (2001) Software Product Lines: Practices and Patterns. 3rd ed., Addison-Wesley Professional, 563 p., ISBN 978-0201703320.
Y. Rogers, H. Sharp, J. Preece (2023) Interaction Design. 6th ed., Wiley, 720 p., ISBN 978-1119901099.
D. Hansen (2025) Model-Based Systems Engineering and Requirements Definition. Achieving a Uniform Management and Engineering System View. Apress Berkeley, CA, 2025, 263 p., ISBN 979-8-8688-2042-7.

Lecturer(s) (name, surname)	Science degree	Main publications
Audronė Lupeikienė	dr.	https://www.elaba.mb.vu.lt/dmsti/?aut=Audronė+Lupeikienė
Kristina Lapin	dr.	https://elaba.mb.vu.lt/mif/?aut=Kristina+Lapin
Virginijus Marcinkevičius	dr.	https://www.elaba.mb.vu.lt/dmsti/?aut=Virginijus+Marcinkevičius