

Learning outcomes for <i>data engineering</i>		
Studies of second degree		
Education profile: general academic		
Job title achieved by graduates: master of science		
CODE	Upon successful completion of second degree studies in the field of <i>data engineering</i> , students:	Relation to discipline-specific (formal sciences) learning outcomes
KNOWLEDGE		
K_W01	know the significance of data processing and data security for contemporary science and technology, and for the development of an information society	X2A_W01, X2A_W06
K_W02	know computational methods and information techniques used to solve problems relating to data mining; are able to build appropriate mathematical models	X2A_W02, X2A_W03, X2A_W04
K_W03	have knowledge necessary to understand and model problems of mining large data volumes	X2A_W02, X2A_W04
K_W04	have extended knowledge of data mining methods, their historical development and significance for the process of acquiring knowledge of the world and for development of humankind; have general knowledge of current progress in this field of study	X2A_W01, X2A_W03
K_W05	have extended knowledge of operations research methods and decision analysis, as well as knowledge of their historical development and significance; demonstrate general knowledge of current developments in these fields of study	X2A_W01, X2A_W03
K_W06	know methods for building mathematical optimization models, as well as theoretical background of using them in practice	X2A_W04
K_W07	have extended knowledge of computer methods of data processing; know selected mathematical software packages, as well as computational and programming techniques which support the work of an analyst and understand their constraints	X2A_W05, X2A_W06
K_W08	know tools for intelligent data analysis and have basic knowledge of methods of multidimensional data analysis; know various information tools facilitating processing, data analysis and statistical inference	X2A_W05

K_W09	know basic sampling schemes for finite populations and methods of analyzing data acquired with the use of these schemes	X2A_W03
K_W10	demonstrate knowledge of basic computational methods and information techniques used to present and analyze data concerning markets and shares, and facilitating decision making	X2A_W03, X2A_W04
K_W11	have knowledge concerning social aspects of information technology; are aware of ethical, legal and economic issues facing analysts, mathematicians and computer scientists, and their professions; have knowledge concerning protection of intellectual property and patent law	X2A_W08, X2A_W09, X2A_W10
K_W12	are familiar with legal regulations and threats concerning data security in information systems	X2A_W08, X2A_W09
K_W13	know general principles of creating and developing forms of individual entrepreneurship which uses knowledge of cryptology for safe data processing	X2A_W10
K_W14	know principles of occupational health and safety for employees working with a computer	X2A_W07
K_W15	have achieved English language proficiency equivalent to level B2+ of European Framework of Reference for Languages and are familiar with specialist terminology from selected branches of mathematics	X2A_W01
SKILLS		
K_U01	are able to use mathematical knowledge in order to model simple tasks specific for a data analyst	X2A_U01, X2A_U02
K_U02	are able to properly formulate a problem in the language of mathematics and carry out an analysis necessary to choose most appropriate software to be used for solving the problem; are able to estimate possibilities and limitations of such approach	X2A_U01, X2A_U02, X2A_U04
K_U03	can plan and carry out an analysis of a practical problem using models and methods of operations research or methods and tools of data mining	X2A_U01, X2A_U02, X2A_U04
K_U04	are able to make a critical evaluation of received results, and conduct an analysis of results sensitivity to changes of parameters and input data	X2A_U01, X2A_U02, X2A_U04
K_U05	are able to present analysis results in their own, independently prepared research report which includes the purpose of the	X2A_U05, X2A_U06

	analysis, methodology used and significance of the results obtained	
K_U06	basing on data stored in data bases, are able to create reports which meet requirements concerning structure and contents	X2A_U05, X2A_U06
K_U07	are able to plan a sample survey based on a selected scheme, can make a critical analysis of collected data and results obtained, and use known statistical packages to conduct multidimensional data analysis	X2A_U02
K_U08	are able to use various tools in order to form questions and generate reports	X2A_U01
K_U09	are able to, in a clear manner, present results of scientific and technological findings related to improving data security, and present their influence on improving security of systems and IT services	X2A_U05, X2A_U06, X2A_U08
K_U10	can present issues of data mining in a clear and commonly understood language	X2A_U09
K_U11	are able to, in a clear manner, both in oral and written form, formulate definitions and theorems, and give examples of applications of mathematical concepts taught during the course	X2A_U08, X2A_U09
K_U12	demonstrate the ability to prepare overviews and written papers concerning applications of mathematics to selected problems and practical issues	X2A_U06, X2A_U08
K_U13	are able to independently get information from literature, Internet, and other reliable sources, process and interpret it, as well as reach conclusions and formulate opinions	X2A_U03, X2A_U08
K_U14	are able to study on their own and have the ability to schedule tasks needed to achieve research objectives	X2A_U07
K_U15	have achieved English language proficiency in the language of mathematics equivalent to level B2+ of European Framework of Reference for Languages	X2A_U10
SOCIAL COMPETENCE		
K_K01	understand the need for extending their knowledge and practical skills by reading scientific journals and popular science magazines	X2A_K01, X2A_K05
K_K02	take active part in dialogues in order to clarify and deepen their understanding of the topic under discussion; can cooperate and work in a team, taking on different roles	X2A_K02, X2A_K03, X2A_K07

K_K03	are able to set priorities in order to accomplish a task set by themselves or by others; are able to think and act in enterprising ways	X2A_K02, X2A_K03, X2A_K07
K_K04	understand and appreciate the significance of intellectual honesty, both in their own and in other people's activities; recognize ethical, legal and social aspects of computerization, respect and follow these principles in their professional activities	X2A_K04
K_K05	are aware of responsibility for making research decisions; understand social aspects of practical application of acquired knowledge and skills and are aware of responsibilities related to these activities	X2A_K06