

Master Degree Exam Requirements

Subject: Information Technology Academic year 2024/2025

1. **Systems thinking and systems sciences** (fundamental principles of systems thinking, comparison of mechanistic and systemic approach, systems engineering definition, design of hard and soft systems, systems analysis, cybernetics, systems dynamics, general systems theory).
2. **Internet and its managerial applications** (structure of the Internet and its evolution, technical conditions for accessing Internet, threats and risks, defending against threats, information search. Applications for managerial activities support, Internet resources utilization, possibilities for applications deployment. Perspectives of further evolution of Internet utilization).
3. **Knowledge management and knowledge technologies** (knowledge, knowledge hierarchy, methodologies of knowledge management implementation, knowledge management framework, types of knowledge, knowledge-based system, generic structure of knowledge-based systems, expert systems, knowledge modelling and representation).
4. **Ontologies and semantic web** (semantic web and its historical background, architecture of the semantic web, metadata, querying, inferencing, linked data, linked data vocabularies, ontologies and their categories, ontological developmental tools, ontological design patterns, ontological representation languages).
5. **Enterprise information systems and IT system management** (information society, information strategy, managing IT, service orientation and IT services, modern approaches in managing IT, ITIL, Cobit, IT governance, types of information systems in support of business activities, implementation of information system in enterprises, contracting information system development, outsourcing, systems integration – types, functions).
6. **Security policy of information systems** (threats, risk analysis, evaluating and auditing IT assets, annual loss expectancy, security strategy, types of countermeasures).
7. **Data protection in PC and network environment** (risks and countermeasures, cryptology - cryptographic system, key, cryptographic protocol, hash function, brute force attacks, monoalphabetic and polyalphabetic ciphers, symmetric and asymmetric encryption, modern encryption systems - DES, RSA, principles of digital signature, malware – types, current situation and trends, principles and techniques of protection, social engineering techniques).
8. **Decision making and its computerized support** (decision making process and its phases, decision making and uncertainty, bounded rationality, decision support system and its characteristics, trends in DSS tools, Business Intelligence, intelligent systems for decision support, multi-criteria decision making, decision making and Internet, perspectives of management support).
9. **Data management** (data warehousing, components and architecture of a data warehouse, OLAP and decision support, data mining).
10. **Multi-agent systems** (agent and its characteristics, environment, reactive agent, rational agent, social agent, organizational paradigms of multiagent systems, application areas of multi-agent systems).
11. **Decision-making, communication and coordination of agents** (rational agent and its architecture, relationship to the game theory, reactive communication, speech act theory, agent communication languages, coordination mechanisms, social conventions, auctions, blackboard architecture, negotiation, reactive communication, speech act theory, agent communication languages, social conventions, auctions, table architecture, negotiation).

12. **Modeling of complex systems and networks** (complex system, complex network and its characteristics, emergence and adaptation, models inspired by biology, cellular systems and automata, system dynamics models, agent-based models, network-based models, simulation model creation, principles of experiments realization, application areas of social agent-based simulations, Milgram experiment, small word networks, growth of networks, searching networks).

Literatura:

- Allemang, D., Hendelr, J.: Semantic Web for the Working Ontologist. Elsevier, 2007
- Buitelaar, P., Cimiano, P.: Ontology Learning and Population: Bridging the Gap between Text and Knowledge. IOS Press, 2008
- Bureš V.: Systems thinking and systems sciences, Gaudeamus, 2009.
- Daconta, M.C., et al.: The Semantic Web. Wiley, 2003
- Ferber, J.: Multi-Agent Systems: An Introduction to Distributed Artificial Intelligence (Addison-Wesley, 1999)
- Gustafson, J.M. HTML5 Web Application Development By Example. Beginner's guide. Packt Publishing, 2013. ISBN 978-1-84969-594-7
- Hvorecký J., Kelemen J.: Readings in Knowledge Management, Iura Edition, 2011
- Jennings, N., Wooldridge, M. (eds): Agent Technology - Foundations, Applications, and Markets (Springer, 1998)
- Kimball R., Ross M., Thornthwaite W.: The Data Warehouse Lifecycle Toolkit: The Complete Guide to Dimensional Modeling. Wiley, 2008
- Luck, M., Ashri, R., D'Inverno, M.: Agent-based Software Development (Artech House, 2004)
- Mellor R.: Knowledge management and information systems: strategies for growing organizations. Palgrave Macmillan. 2011
- Nilsson, N.: Artificial Intelligence - A New Synthesis (Morgan Kaufmann, 1998)
- Orand B., Villarreal J.: Foundations of IT Service Management: The ITIL Foundations Course in a Book, CreateSpace Independent Publishing Platform, 2011
- Handbook of Applied Cryptography: <http://www.cacr.math.uwaterloo.ca/hac/>
- Russell, S., Norvig, P.: Artificial intelligence - a Modern Approach (Prentice Hall, 2003)
- Schiesser R.: IT Systems Management, Prentice Hall, Boston, 2010
- Staab, S., Studer, R. (Eds.): Handbook on Ontologies. Springer, 2004
- Stuckenschmidt, H., van Harmelen, F.: Information Sharing on the Semantic Web. Springer, 2005
- Sward D.: Measuring the Business Value of Information Technology, Intel Press, 2006
- Turban, E. a kol.: Decision Support and Business Intelligence Systems (9th Edition), Prentice Hall, 2010
- Vidal J.M.: Fundamentals of Multiagent System Textbook <http://www.multiagent.com/fmas> (online, 2007)
- Vlassis, N.: A Concise Introduction to Multiagent Systems and Distributed AI http://staff.science.uva.nl/~mmaris/class_2006_2007/cimasdai.pdf (online, 2007)