

State Final Examinations	Academic Year: 2021/2022
Master's Degree Studies Program:	Engineering Informatics
Study Branch:	Information Technologies

Information and Communication Systems

Compulsory Subject

1. Categorization of signals, basic characteristics, examples. Mathematical tools for signal description, modelling and analysis.
2. A principle and a purpose of a signal sampling - conditions for the signal sampling. A principle and a purpose of the signal quantization - consequences of signal quantization from the point of view of the noise presence. Basic principles and applications of digital signal processors. A principle and a purpose of modulation. Examples of various types of modulation.
3. Error Correction Codes – ECC (geometric model, Hamming distance, Hamming weight of code), correction and detection code capabilities. Systematic ECC (general characteristics, optimal and perfect code, categorization). Cyclic codes, concatenated coding – convolution codes and Turbo codes.
4. Lossy compression in telecommunication systems – compression of the voice and TV signals. Technique “Voice over IP” – VoIP. Technology xDSL – description, characteristics, modulation. Description of ADSL technology.
5. Cybersecurity and information security risk management in companies. The Cybersecurity Act, implementing decree and regulations. Security standards ISO 27000 (ISO 27001). COBIT and ITIL methodologies.
6. Hash functions, principles of symmetric and asymmetric cryptography. Digital certificates: qualified, system, server and personal. The digital signature algorithm.
7. Archiving, data backup and recovery, disk arrays RAID. Penetration testing, computer systems and mobile technologies attacking. Security issues in virtualization, hosting and outsourcing technologies.
8. Classification of viruses: file viruses, resistant, stealth, encrypted viruses, polymorphic, metamorphic, oligomorphic and retroviruses.
9. Defence strategies of viruses: anti-debugging functions, hanging on INT, CRC and breakpoints, defence against heuristic analysis, defence against emulation, code obfuscation, armoured viruses, memory tunnelling viruses.
10. 10. Aggregation, FUP and QoS, Variants of PC and LAN Connections to the Internet - DSL, CATV, GPRS and EDGE, CDMA, UMTS, LTE, 5G and WiMax, LAN with 230V distributions.
11. How to handle DNS queries, DNS servers, and BIND under Linux. DDNS.
12. DHCP, NAT and PAT, VLAN, VPN. Electronic mail and firewalls. UPS.
13. CIDR, routing tables, routing rules, and routing information updates. Autonomous systems and routing protocols.
14. A layer of MAC protocol 802.11: the format of the packet, the meaning of the packets Beacon, example of communication in station association with AP, an example of communication using RTS / CTS mechanism, an example of communication during a packet transmission error (CRC error).

15. Von Neumann architecture and Harvard architecture of computers. Principles of computer architecture with modern microprocessor components. Advantages of custom circuits due to application tasks solved by a microcomputer. Architectures for future processors. Definition of Moore's Law and its impact on technological trends. Characteristics of next generation processors in the category PIM (Processor-In-Memory), IRAM (Intelligent RAM), or C-RAM (Computational RAM).
16. The architecture of components of the gate arrays type. Advantages of custom circuits of CPLD and FPGA in the implementation of digital and mainly microprocessor systems. The basic methodology of digital systems using VHDL design. Methods of simulation of circuit models and systems by this methodology.
17. Requirement engineering. Methods of requirement gathering. Categorization of requirements. Graphical (diagram) and textual approach for documentation of requirements.
18. Role and principles of Use Case Model in UML. Use Case model, actors, use cases, element relationships – generalisation, include, extend. Use case scenarios, use case scenario branching.
19. Principles of object-oriented design and its role in class modelling in UML. UML class role and definition, types of associations between classes, multiplicity. Class elicitation methods, attributes and operation definitions.
20. Software effort estimation methods. Use case points method principles, calculation workflow.