Information Technology in Process Control

Study programme: N0714A270012 Control of Machines and Processes
Academic year: 2024/2025

1. Algorithmization, algorithm, properties of algorithms, ways of writing algorithms (Program description, flow charts diagrams, structure diagrams, activity diagrams), their comparison and development.

2. Sorting algorithms, dividing and properties of sorting algorithms, examples of solutions. Stable and unstable algorithms. Evaluation of the effectiveness of algorithms.

3. Fundamental concepts from the field of coding theory, checking and self-correcting codes, Hamming code, cyclic codes, concepts: linear codes, Hamming distance, linear codes, prefix codes, construction of Huffman Code, control and generating code matrices, syndrome.

4. Cryptography, Transposition and transcription systems, types of ciphers, examples of ciphers. Public key system – RSA, Principle of DES.

5. Python fundamentals, Data types, variables, operators, calling function, data collections, creating and using modules.

6. Main features and concepts of OOP (classes, encapsulation, inheritance, polymorphism). Differences between OOP languages and non-object-oriented programming languages.

7. Characteristics and division of operating systems. Definition, typical tasks, distribution (according to design, structure, purpose and real-time requirements), examples of selected operating systems.

8. OS kernel and multitasking. The meaning and function of the kernel, process and thread management, types of multitasking, scheduling algorithms, context switching, examples of implementation in selected operating systems.

9. Memory management and inter process communication of multitasking operating systems. Features, targets, allocation methods, and virtual memory paging algorithms. Ways of inter process communication, synchronization mechanisms (critical sections, semaphores, mutexes) and the problem of priority inversion.

10. Interrupt management and I/O System of Operating systems. Classification of I/O devices, device drivers, communication methods. The principle of interrupt processing in the operating system, asynchronous I/O processing, the relationship of interrupts to multitasking.

11. Syntax and semantics of the C language. Declaration of variables, data types, operators, visibility and lifetime of variables, blocks; creation of functions, passing parameters by value and reference, recursion.

12. Program flow control, structured data types of the C language. Conditional expressions (if-else, switch case), loops (for, while, do-while) command. Structures, enum types and unions.

13. Pointers at C language. Pointers arithmetic, arrays and strings, command line arguments.

14. Work with inputs and outputs, files and standard devices (keyboard screen). C preprocessor, preprocessor commands, Process of compilation and linking.

15. The OSI model – description of network structure layers according to ISO recommendations, comparison with TCP/IP model. Network elements and protocols on individual layers of the TCP/IP network model.

16. Addressing in IP networks. IP addresses, masks, subnets, addressing scheme. VLAN - characteristics and use.

17. Selected terms in the field of computer networks: well-known ports, default gateway, MAC addresses, IP, DHCP server, DNS, static vs. dynamic paths and routing.

18. Router and switch configuration, basic approaches, prompts and commands, configuration of router interfaces, configuration of basic router and switch security.

19. XML language and its validation. Purpose and use of the XML language, structure of the XML document, rules for creating elements and attributes, namespace. Definition and validation of the XML document with the XSL schema and DTD.

20. Processing and transformation of XML documents. Use of DOM technology for reading, creating and editing documents, XSL and XSLT for their transformation. Querying over XML. XPath, XQuery technologies.

21. The SQL language (Transact SQL), a subset of Data Definition Language Statements, Data Control Language Statements, and Data Manipulation Language Statements. Purpose and examples of use. Language control structures, function and procedure calls.

22. Data manipulation in the SQL language (DML). Searching, aggregating and sorting records. Querying data over multiple tables, queries with subqueries, editing and deleting records.

Aktualizace: 26. 3. 2025