Bachelor Exam Requirements
Applied Informatics

Hardware and Software Technologies (TSP)

Academic year 2025/2026

1. **Basic principles of computers** (electrical circuits and their calculations, number systems, logical functions, adjustment and minimization of logical functions).

2. **Basics of microprocessors** (basics of microprocessor architecture, processor components, processor division, CISC and RISC architecture, machine instructions and their processing, buses and their meaning, DMA, interrupt principle).

3. **Basics of computer architecture** (basic computer components, motherboard and its functions, chip set, microprocessors, processor microarchitecture, microprocessor properties, microprocessor communication with the environment, PCI and its modifications, PC interface, USB).

4. **Computer memories** (division of memories, basic parameters of memories, hierarchical memory systems, registers, cache, ROM and RAM, newer types of DIMM memories, disk memories, physical disk structure, logical disk structure, removable storage media).

5. **Operating system principles** (microkernel and monolithic kernel, process, threads and states, CPU allocation methods, memory allocation methods, process synchronization).

6. **File systems and data structures** (file system principles, file attributes, file operations, mapping a file to virtual memory, internal file structure, sequential and direct file access, VFS in Linux, forced and unforced file locking).

7. **RM ISO/OSI and TCP/IP** (Description and comparison of the ISO/OSI and TCP/IP models, the fundamental communication protocols of TCP/IP and their functions, RFC documents, the principle and implementation of layer addressing (PDU names), and the principle of operation of model-based networks).

8. **Routing and switching** (Basic principles of switching and routing, basic protocols for L2 and L3 communication control, roles of MAC and IP addresses in the data communication process, routing algorithms, topology, roles and functions of router and switch).

9. **Windows operating systems** (Windows architecture and its subsystems, system processes - smss.exe, csrss.exe, winlogon.exe, svchostl.exe, etc.), server operating systems boot model).

10. **Linux operating systems** (Linux and GNU, system start, modern kernel architecture, kernel and kernel external interface, control basics - shell, system calls, signals and response to signals, communication using routers and messages, udev daemon, systemd, crond, memory management in Linux).

11. **General principles of the Internet of Things (IoT)** (IoT characteristics, IoT applications, IoT system components and their description, feedback, IoT and privacy, IoT reference models and their characteristics, analog/digital signal and conversion between them, constrained devices).

12. **Communication and security in IoT** (Networking technologies, communication models in IoT, lower and higher layer protocols, edge/fog/cloud computing, wireless sensor networks, SMART concept, security at device, communication and application level, threat and vulnerability assessment process).

13. **Principles of object-oriented programming** (Basic concepts (statement, variable, type, function), principles of object-oriented approach (terms, concepts, properties). Visualization of the object model and its implementation).

14. **Data representation and their processing** (array, list, sequence: their object representation, basic algorithms, collections. Streams and file processing, object persistence, data processing in CSV, JSON and XML formats).

15. **Data structures** (basic data structures and their principles, queue, stack, array, linked list, cyclic linked list, queue and stack implementation, circular buffer, associative array).

16. **Creating user interface** (UI components, component layout, responsive UI. Event-driven programming. Interfaces (programming constructs) and inner classes. Model-View-Controller and related approaches).

17. **Network and multitasking applications** (Basic concepts (client, server, protocol, socket). Network communication principles. Multitasking applications. Client-server model, server types, parallel request processing).

18. **Publishing on the web** (Markup, styling, and scripting languages. Responsive design, implementation methods. Accessibility, principles, implementation techniques. Design, development, and testing of websites. Document object model, application programming interface of browsers).

19. **Object-oriented modeling** (purpose of models, object and class, principles of object-oriented design, analysis and design class diagram, UML, association, generalization).

Literature

Stallings, William. Operating Systems: Internals and Design Principles. 9. vydání. Pearson, 2018. ISBN: 978-0134670959

Chakraborty, Pranabananda. Operating Systems: Evolutionary Concepts and Modern Design Principles. 1. vydání. New York: Chapman and Hall/CRC, 2023. ISBN: 97810033830551

Negus, Christopher. Linux Bible. 10. vydání. Wiley, 2020. ISBN: 978-1119578888

Dulaney, Emmett. Linux All-in-One For Dummies. 6. vydání. Wiley, 2018. ISBN: 978-1119901928

Perrott, Sara. Windows Server 2022 & Powershell All-in-One For Dummies. 1. vydání. Wiley, 2022. ISBN: 978-11198678211.

Lammle, Todd. CCNA Routing and Switching Study Guide: Exams 100-101, 200-101, and 200-120. CANADA, 2013. ISBN 978-1118749616.

Kozierok, Charles M. The TCP/IP-Guide No Starch Press, 2005. 348324634

HANES, David, et al. IoT fundamentals: Networking technologies, protocols, and use cases for the internet of things, Cisco. USA, 2017. ISBN 9781587144561.

Stuart Borlase . Boca Raton. Smart grids: infrastructure, technology, and solution: CRC Press. 2013. ISBN 978-1-4398-2905-9.

HAVERBEKE, Marijn. Eloquent javascript: A modern introduction to programming. No Starch Press, 2018.

CONNOLLY, Randy, et al. Fundamentals of web development, 3rd Edition. Pearson, 2021.

Arlow, J., & Neustadt, I. (2005). UML 2 and the unified process: practical object-oriented analysis and design. Pearson Education.

Silver, B., & Richard, B. (2009). BPMN method and style (Vol. 2). Aptos: Cody-Cassidy Press.