Master's degree Exam Requirements
Applied Informatics

Software Engineering (SOFI)

Academic year 2025

1. **Mobile technology** (historical development, classification of mobile devices – types, OS, categories of applications, specific problems of mobile platforms, sensors and their use in the context of the mobile user).

2. **Mobile application development** (specifics of mobile software development, native vs. hybrid development. Basic characteristics of the Android OS (architecture, tools) or iOS. Development tools and languages/frameworks for native development. General issues of UI creation (Views, Compose, Swift UI, or others). Use of specific HW, methods of connection to IS).

3. **Inversion of Control (IoC)** (Principles, objectives and usage of such approach, relationship between IoC and Dependency Injection. Examples of usage, tools that support IoC).

4. **Architecture of information systems** (business logic layer, presentation layer, data layer – use of relational and non-relational DBs in the context of IS, design patterns for IS, creation methodologies, communication between IS, automation, DevOps, use in the Cloud).

5. **Web services and microservices** (meaning of SOA, WS and microservices. Principles of SOAP vs REST, XML and JSON. Tools for creating microservices).

6. **NoSQL databases and their basic principles** (scaling, replication, data distribution options, Map&Reduce, sharding, data persistence, security, CAP theorem, BASE model).

7. **Data in distributed systems** (BigData and its sources, dataset and its lifecycle, open data, big dataset trend, 5V, BigData types and data formats, BigData problems).

8. **Structure and architecture of UNIX / GNU/Linux systems** (system structure, file system, system process, OS services, shells, instructions of shells, kernel description, kernel data structure, system buffers, I/O subsystem, memory management, real-time operating systems (basic characteristics, the main factors, definition, hard and soft RTOS, RMS, EDF, RTOS examples).

9. **Process control in UNIX (GNU/Linux) system** (process creation, signals, process termination, invocation by other process, real and efficient UID, process sizing, process management, process scheduling, SysRQ (usage, functions)).

10. **Basic UNIX (GNU/Linux) user administration** (managing files and directories, operations with files and directories, searching file systems, user identity, process identity, identity file and change, access control and access control settings, input/output redirection, command interconnection, user administration, backup, programs for data archiving and data compression, working in command interpreters, SMART technology (meaning, usage, selected values)).

11. **Information and data security** (Categorization of security approaches (physical, information, cyber, network, personnel security, etc.), analysis of assets, risks and threats, security policy, risk management plan and countermeasures. Key legislative and internationally recognized standards in the field of information and cyber security. Malware and malware protection. The AAA principle in security, network security, increasing the resilience of systems and backups, HW protection options).

12. **Cryptography** (Basic principles and concepts of cryptography, classification of ciphers (substitutional, monoalphabetic, homophonic, etc.), cryptographic system, key, time and memory complexity, cryptanalysis. Hash functions, steganography, symmetric and asymmetric encryption, public key infrastructure, certificates and certification authorities).

Literature

C. Walls, "Spring in Action," 6th ed. Manning Publications, 2021.
S. Newman, "Building Microservices," O'Reilly Media, 2015.
Android Mobile App Developer Tools. URL: https://developer.android.com/ (online)
Spath. P. Pro Android with Kotlin – Developing Modern Mobile Apps with Kotlin and Jetpack, Apress, 2022, ISBN 978-1-4842-8744-6
Balusamy, Balamurugan, Seifedine Kadry, and Amir H. Gandomi. Big data: concepts, technology, and architecture. John Wiley & Sons, 2021. ISBN 9781119701828.