



Academia de Studii Economice
Departamentul de Informatică și Cibernetică Economică

Calea Dorobanți, 15-17, Sector 1, București, 010552 (camera 2314)

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Contest Topics for Professor
Position 28, year 2023-2024, semester 1

Disciplines: Blockchain, quantum cryptography and E-Payment Security / E-Commerce; Multiparadigm Programming – Java; Distributed and Parallel Systems Security; IoT (Internet of Things), Embedded and Robotic Systems Security.

Blockchain, quantum cryptography and E-Payment Security / E-Commerce :

1. De-FIN, Fin-Tech & Case studies and integration of Blockchain platforms in e-commerce and payment systems;
2. Reasons for using e-payment systems;
3. Blockchain DApp & Smart Contracts;
4. On-line and off-line payment systems with electronic money;
5. EMVCo Payment Systems;
6. Blockchain Technologies and Platforms;
7. Technologies and Platforms for Quantum Computing.

Bibliography:

1. Ford W., Secure Electronic Commerce, Prentice Hall, 2001, USA
2. Housley R., Planning for PKI, John Wiley, 2000, USA
3. Patriciu V., Bica I., Pietrosanu M, Securitatea comertului electronic, All, 2001, România
4. Andreas M. Antonopoulos, Mastering Bitcoin, O'Reilly, 2014, USA
5. Johan Vos, Quantum Computing in Action, Manning, 2022, USA
6. Andreas M. Antonopoulos, Gavin Wood, Mastering Ethereum, O'Reilly Media, Inc., 2018, USA

Multiparadigm Programming – Java:

1. GUI Intro (FX) and event handling/event programming paradigm. Java FX 8 (MVP - Model View Presenter) design pattern architecture for RIA - Rich Interface Applications;
2. Java and JVM, JDK, JRE Overview, command line and IDE Eclipse/Netbeans/IntelliJ IDEA compiling and running - including build automation tools: ANT/Maven/Gradle. Java SE Synthax intro (if, switch, for, while), methods, Arrays, OOP intro and C++ analogy /



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Ubuntu Linux or MS Windows, the Java byte-code class running without any modification/re-compiling. Multi-paradigm programming intro;

3. Java Arrays and OOP Intro - class, object, abstract class, interface. Java SE Deployment alternatives from command line classes and libraries/JARs to ANT/Maven/Gradle build automation tools and Continuous Integration Engineering in Jenkins;
4. Java OOP - Class, Objects + Immutable objects, Interface, Abstract Class, Inheritance, Polymorphism - late binding, "has a" versus "is a" relationship, Interface as Type (declarative versus real type) analogy with C++ "pure" polymorphism, ClassCastException + Robocode Assignments;
5. Java Generics Programming and Datastructures/JCF - Java Collection Framework in analogy with C++ STL (Standard Template Library) in terms of: containers, iterators, and algorithms. JCF - Arrays, Lists, Hashtable, etc.;
6. Java I/O - Input / Output at byte and char level in stream oriented approach, File and RandomAccessFile classes. Java Native Interface - JNI (for understanding native methods) and Annotation plus Reflection (for understanding FTP server/automation of tests and XML parsing) will be a plus for understanding future topics. Also minimal JUnit 4 Intro as exemplification of the annotations and reflections topics;
7. Java I/O serialization, annotation + reflection, and JNI. Also as new topics the exceptions mechanism and two Source Code Design Patterns - Factory Methods and Singleton;
8. Java 8 Features and Functional Programming Paradigm: Nashorn JavaScript Engine, Call-back and Inner Classes, Method references, default method, lambda expressions + functional interfaces, processing streams, Optional, Date/Time, and new API (Base64);
9. Multi-threading vs. multi-process, Multi-threading models, features of the concurrent and parallel programming paradigms, atomic operations, JVM and OS threads; Java API for multi-threading, Java Multi-threading issues – Singleton vs. Immutable Objects - Software Design Patterns impacted by Multithreading; Parallelism/HPC - High Performance Computing - Q&A - sample for concurrent access and file parallel copying;
10. Advanced Java Multi-threading (java.util.concurrent - ExecutorService + Future-Callable + Lock/Semaphore + Producer/Consumer) and Java 8 Lambda expressions for multi-threading mechanisms;
11. Java Networking Intro: TCP vs. UDP over IP with Java Socket programming. TCP case study with multi-threading for implementing FTP and HTTP protocol;
12. Java NIO (New Input/Output), RegEx (Regular Expressions) and JDK 9/11 Modules + Java 9/11 New Features (e.g. Reactive Streams, HTTP2 Client, modified try-catch statements, etc.);
13. Java XML (JAXB2) and JSON Parsing (JSON.org / Jackson);
14. JDBC and NoSQL Database Programming.

Bibliography:

1. Jonathan Knudsen, Patrick Niemeyer, Learning in Java, O'Reilly, 2005, USA;
2. Bruce Eckel, Thinking in Java, Prentice Hall, 2003, USA;



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3. Joshua Bloch, Effective Java, 3rd Edition, Pearson Education / Addison-Wesley Professional, 2018, USA;
4. Cristian Toma, Suport curs și laborator, Online, 2021, <https://acs.ase.ro/java>
<https://github.com/critoma/javase>, România

Distributed and Parallel Systems Security:

1. Parallel Computing with OpenMP;
2. Distributed Computing with OpenMPI;
3. Secured middleware technologies;
4. Remote procedure call;
5. Distributed programming;
6. Development of secured distributed services;
7. Group security in distributed systems;
8. Communication security;
9. Development of distributed systems that guarantee the data confidentiality within the business environment;
10. Implementation of new and existing protocols for distributed systems;
11. Distributed systems and algorithms;
12. Network communication models;

Bibliography:

1. Andrew S. Tanenbaum, Computer Networks – 4/E, Prentice Hall Publishing House, 2003, Statele Unite ale Americii
2. William Stallings, Cryptography and Network Security, Prentice Hall, 1999, Statele Unite ale Americii
3. Bruce Schneier, Applied Cryptography, John Wiley & Sons, 1996, Statele Unite ale Americii
4. Florian Mircea Boian, Programare distribuită, Albastra, 1999, România
5. Victor Valeriu Patriciu, Monica Ene Pietroșeanu, Ion Bica, N. Voicu, C. Vaduva, Securitatea comerțului electronic, All, 2001, România
6. Victor Valeriu Patriciu, Monica Ene Pietroșeanu, Ion Bica, C. Cristea, Securitatea informatică în UNIX și INTERNET, Tehnica, 1998, România
7. Brendan Burns, Designing Distributed Systems, O'Reilly Media, Inc., 2018, USA



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IoT (Internet of Things), Embedded and Robotic Systems Security:

1. IoT Devices – Nodes and Gateways
2. IoT Intro & IoT PaaS/SaaS Clouds: Oracle, Amazon AWS, Microsoft Azure, IBM Bluemix
3. IoT Communications Protocols: MQTT, CoAP, REST-HTTP(s)/TCP
4. IoT Smart Objects & WSN - Wireless Sensor Networks
5. Embedded Linux C Programming
6. Serial digital interfaces programming: UART, SPI, I2C, GPIO
7. Use-cases & Hacking of IoT devices;
8. ARM Assembly for developing anti-viruses and viruses
9. IoT Security - Secure Element & Java Card

Bibliography:

1. Rob Barton, Gonzalo Salgueiro, David Hanes, IoT Fundamentals, Cisco Press, 2017, USA
2. Aditya Gupta, The IoT Hacker's Handbook: A Practical Guide to Hacking the Internet of Things, Apress, 2019, USA
3. Stephen Smith, Raspberry Pi Assembly Language Programming: ARM Processor Coding, Apress, 2019, USA
4. Stephen Smith, Programming with 64-Bit ARM Assembly Language: Single Board Computer Development for Raspberry Pi and Mobile Devices, Apress, 2020, USA