Transilvania University of Braşov, Romania

Study program: Modern Technologies in Software Systems Engineering
2023-2025

Faculty of Mathematics and Computer Science
Study period: 2 years (master)
Academic year structure: 2 semesters (14/12 weeks per semester)
Examination sessions (two): winter session (January/February)
summer session (June/July)

Courses per years

| Course title | Code | No. of credits | Number of hours per week | | | |
|---|---|---|---|---|---|---|
| | | | course | seminar | laboratory | project |
| Architecture of Enterprise Software Systems. .NET Platform | ASSEN | 8 | 2 | | 2 | |

**Course description (Syllabus):** Introduction to enterprise architectures. Structuring on levels. Organizing the domain logic. Architectural models for domain logic. Architectural models for data sources. Object-relational behavioral models. Object-relational structural models. Web presentation templates. Distribution models, concurrent access Models of maintaining the state. Basic patterns for enterprise applications.

| Course title | Code | No. of credits | Number of hours per week | | | |
|---|---|---|---|---|---|---|
| | | | course | seminar | laboratory | project |
| Introduction to Data Science | IDS | 7 | 2 | | 2 | |

**Course description (Syllabus):** Foundations, relationship to statistics, early usage, modern usage, Data Science and Data Analysis.

| Course title | Code | No. of credits | Number of hours per week | | | |
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| | | | course | seminar | Laboratory | project |
| Distributed Programming Techniques | TEHPD | 8 | 2 | | 2 | |

**Course description (Syllabus):** WebSocket; Web application frameworks (Struts, Java Server Faces); AJAX, Google Web Toolkit; Web Services (Schema, WSDL); JAX-WS and JAX-RI services; 0SGi.

| Course title | Code | No. of credits | Number of hours per week | | | |
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| | | | course | seminar | Laboratory | project |
| Mobile Devices Programming. Android Perspective. | PDMPA | 7 | 2 | | 2 | |

**Course description (Syllabus):** Android SDK and Android Studio; Advanced Java concepts; Design and implementation of Android interfaces; Fragment and Intent; Ensure compatibility with previous versions; Databases in Android; Sensors and actions / gestures; Multimedia, localization, communication, NFC; Execution threads; Services.

| Course title | Code | No. of credits | Number of hours per week | | | |
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| | | | course | seminar | laboratory | project |
| Algorithms in Combinatorial Optimization | AOCOM | 8 | 2 | 1 | 1 | |

**Course description (Syllabus):** Maximum flows and minimum cuts; Matching problem; Minimum flows.

| Course title | Code | No. of credits | Number of hours per week | | | |
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| | | | course | seminar | laboratory | project |
| Modern technologies for OSX, IOS | MTOI | 8 | 2 | | 2 | |

**Course description (Syllabus):** Xcode Cloud, App Store, Swift, Augmented Reality, Graphics and Games, SharePlay, ShazamKit, etc.

| Course title | Code | No. of credits | Number of hours per week | | | |
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| | | | course | seminar | laboratory | project |
| Ethics and academic integrty | ETHIC | 2 | 1 | | | |

**Course description (Syllabus):** Researchers should promote accuracy, honesty, and truthfulness in their work; Researchers should work in a fair manner taking into account issues of equality, impartiality, and proportionality; Researchers should show respect to the fundamental rights, dignity, and worth of all people.

| Course title | Code | No. of credits | Number of hours per week | | | |
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| | | | course | seminar | laboratory | project |
| ORM technologies | TEORM | 7 | 2 | | 2 | |

**Course description (Syllabus):** The business logic of an application: EJB container, communication between components (local, remote), middle tier and connection with EIS, the advantages of using EJBs; Steps in designing an enterprise application containing EJBs; Session bean: stateless and stateful. The life cycle, the role of callback methods; Customers of applications containing EJBs, JNDI service, specific annotations; Special session bean: single session bean, asynchronous methods (Future objects); JMS service: communication between components through messages, producer and consumer, message features, message architectures: Point to Point, Publisher-Subscriber. Application for using a queue, respectively topic messages, Connection Factories

| Course title | Code | No. of credits | Number of hours per week | | | |
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| | | | course | seminar | laboratory | project |
| Big Data and Machine Learning | BDAML | 7 | 2 | | 2 | |

**Course description (Syllabus):** Big data and their relevance in various domains; The importance of data analysis, and the infrastructures for the design of big data algorithms; Parallel and distributed architectures. Platforms; Introduction to cloud computing. Taxonomy; Cluster computing; Grid computing; Kernel based learning; Models that are based on support arrays; Reinforcement learning; Neural networks and deep learning.

| Course title | Code | No. of Credit | Number of hours per week | | | |
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| | | | course | seminar | laboratory | project |
| Non-sequential functional programming | PROFU | 7 | 2 | | 2 | |

**Course description (Syllabus):** Programming imperative to functional programming. Sequential

programming versus distributed programming. Characterization. Benefits. disadvantages; Functional programming elements. Use of a functional programming language; Distributed systems. Distributed algorithms; Non-sequential programming elements (parallel, concurrent, distributed); Development of non-sequential applications with functional programming languages. Characterization. Benefits. disadvantages; Support Python language for developing distributed functional applications; Haskell language support for parallelism and competition; Approaching distributed computing with functional agents; Functional applications in scientific simulations

| Course title | Code | No. of credits | Number of hours per week | | | |
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| | | | course | seminar | laboratory | project |
| Advanced elements of computational Graphics | EAGCO | 8 | 2 | | 2 | |

**Course description (Syllabus):** Graphics in Visual C ++. Animation; Projections (orthographic, perspective); 3D transformations, homogeneous coordinates; Hiding rear faces and z-buffering; Lighting, shading; Application of textures; Ray-tracing; OpenGL (presentation and management of OpenGL states, drawing objects, visualization, coloring, lighting, transformations, 3D effects, texturing).

| Course title | Code | No. of credits | Number of hours per week | | | |
|---|---|---|---|---|---|---|
| | | | course | seminar | laboratory | project |
| Management of computer networks | ARETC | 7 | 2 | | 2 | |

**Course description (Syllabus):** Elementary concepts regarding the Linux disk; Working with files, command substitution, environment variables; Working with processes. Users administration; GRUB, Inittab, runlevels. Working with packages, The Linux kernel and its administration; NFS, NIS; DNS in Linux, the BIND server; The allocation of IP adresses, DHCP.

| Course title | Code | No. of credits | Number of hours per week | | | |
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| | | | course | seminar | laboratory | project |
| Cloud computing | CLCOM | 8 | 2 | | 2 | |

**Course description (Syllabus):** What is a cloud. History. Characteristics. Costs. MapReduce paradigm. YARN scheduler; Multicast problem. Gossip protocol. Membership. Mathematical modelling of the protocol; Grids. Peer—to— peer systems. Napster. Gnutella. FastTrack and BitTorrent. Chord. Pastry. Kelips; Key—value stores. Apache Cassandra. CAP theorem. Consistency models; Time and ordering. Christian algorithm. NTP. Lamport timestamps. Vector timestamps; Global snapshots. Chandy-Lamport algorithm. Consistent cuts. Safety and liveness; Multicast ordering. Reliable multicast. Virtual synchrony; Consensus problem. Paxos. Leader election algorithm. Chubby. Zookeeper. Bully.