Transilvania University of Braşov, Romania

Study program: Modern Technologies in Software Systems Engineering

Faculty: Mathematics and Computer Science
Study period: 2 years

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Arhitecture 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			
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Advanced Elements in WEB Applications Developing with PHP and My SQL	EAWPS	7	2	-	2	-

Course description (Syllabus): Introduction. PHP recap of the fundamentals; Installation, configuration, first example; Model, controller and view levels; Routing, Advanced Model Elements; Testing units, Functional tests; Forms, Forms testing; Feeds and web services, Email service, Ajax.

Course title	Code	No. of credits	Number of hours per week			
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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; OSGi.

Course title	Code	No. of credits	Number of hours per week			
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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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Algorithms in Combinatorial Optimization	AOCOM	8	2	1	1	-

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

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Advanced Elements in Software Systems Engineering	EAISS	8	2	-	2	-

Course description (Syllabus): The importance of abstraction in the creation of software systems; Problems in the modeling of software systems logic (Problem statement statement, Goal setting, Rigorous capture of user requirements); Advanced elements in the design of a software system solution (Architecture, Detailed design, Fundamentals of modularization of software systems); Orientation on services as a philosophy of development of complex software systems; Component orientation as a method of promoting interoperability and reuse of software components; Software testing. Test levels and model.

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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

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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.

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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			
			course	seminar	laboratory	project
Advanced elements of computational graphics	EAGCO	8	2	-	2	-

Course description (Syllabus): Graphics in Visual C ++. Animation; Projections (spelling, 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			
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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			
			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.

Course title	Code	No. of credits	Number of hours per week			
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Introduction to Natural Language Processing	INLP	7	2	-	2	-

Course description (Syllabus): Current issues (practical, theoretical and research) in mathematical and computational linguistics and in natural language processing; Processing, normalization, segmentation. Introduction and presentation; Quantitative aspects of natural language; Linguistic similarity problems; Efficient computational approaches and solutions to problems of morphology, phonology and semantics; Computational analysis of stylistic fingerprinting; Problems of semantic change, reconstruction of protowords, language evolution; Automatic detection of opinions from texts, computational analysis of sentiment polarity, offensive language.

Course title	Code	No. of credits	Number of hours per week			
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Image processing using intelligent algorithms	IPIA	7	2	-	2	-

Course description (Syllabus): This course presents the fundamentals of image processing and progressively focuses on advanced intelligent algorithms for image analysis. In the first part, basic image processing algorithms are introduced, including image enhancement, histogram-based processing, filtering, and morphological operations. Various image compression techniques are also discussed. The second part of the course emphasizes intelligent and adaptive approaches, including evolutionary algorithms and neural network–based methods for image processing and analysis. The course also addresses multi- and hyperspectral image processing, with a focus on satellite data.