Master of Science
Database Administration

Courses description

Advanced Database Systems

This course presents elements of advanced database systems: Object-relational database management systems (application servers, optimizing object-relational systems, rule systems); Deductive databases, parallel databases, parallel algorithms for relational operators; Distributed databases; On-line analytical processing (OLAP) and algorithms; Applying information theory concepts in studying and implementation of databases.
Application hours target is to deepen and exemplify current algorithms and methods exposed: experiments on the characteristics of object-relational database management systems, study and simulation of parallel algorithms of processing data, Apriori algorithm, XML applications, and experiments on the database transactions evolution.

Database Systems Implementation

The course presents integrated application architectures and specific implementation issues among a database system: integrated systems architecture, database architecture for embedded systems, web applications and desktop architecture, systems analysis methods, methods of implementation and parameterization of an integrated system, selection criteria and methods of performance evaluation of embedded systems, security of database systems, security of transactions in a database, distributed database applications, specific management issues for database administration, auditing of databases, data replication and backup methods.

Information Systems Security

The course discusses topics regarding the security of standalone systems but also security of systems integrated in networks: security models, security in organizations, cryptography, public key infrastructure, physical infrastructure, infrastructure security, authentication and access, wired and wireless networks security, intrusion detection

systems, security practices and attacks, messaging, web components, secure software development, disaster recovery, risk management, change management, privilege management, privacy, forensics, legal issues.
The discipline offer also hands on training on: Linux security, vulnerabilities and exploits, brute force and dictionary based attacks, software bombs, firewall configuration, IP address and port scanning, vulnerability scanners, Metasploit, security auditing, penetration testing.

Architecture of Service Oriented Information Systems

The course explains the concept of the different architectural views (e.g. function view, organization view, data view, output view) and the relationships between those individual views. There will be explained the principles for process orientation. Students will understand and interpret the models and methods for developing information systems architectures. They will be taught how to use those models and methods to define overall information systems architecture. The practical applications of this course offers to students the possibility to describe the principles of information systems; use in the correct way the standards for encoding numbers and letters; describe the conceptual basis of communications standards: TCP/IP, UDP; create and manage XML documents; writing simple SQL statements and XQuery code for database; create a web service based on SOAP/REST standards; writing a simple client application extension for internet standards; understand architecture for distributed applications.

Data Mining and Data Warehousing

This course presents technologies, methods and algorithms for Knowledge Discovery in Databases (KDD, also known as Data Mining). The course presents various classes of problems and their specific algorithms: Data Preprocessing, Association Rules and Sequential Patterns, Supervised Learning, Unsupervised Learning, Partially Supervised Learning, Information Integration, Web Usage Mining.
The last part of the course contains an introduction in Data Warehousing and also describes some techniques for Dimensional Modeling and it use in storing data.
Application hours target the understanding, presenting and testing some data mining algorithms, evaluation of their results for different datasets and different parameter values but also some case studies in Data warehousing.

CASE tools for designing database applications

The course presents CASE (Computer Aided Software Engineering) tools for designing software applications. We will present some of the most common types of CASE tools, the architecture of these tools, generations of CASE tools and facilities they offer, methods for comparing and evaluating CASE tools. During the course there will be practical demonstrations of designing a database using the XCASE tool, it will be presented TOAD tool and will be developed a didactic project using Oracle Designer tools provided by Oracle Company. Students will create a database project using CASE tools.

Advanced Database Administration

This course introduces students to the foundations of database systems and prepares them to administer complex databases. It introduces students to the foundations of database systems, focusing on basics such as the relational algebra, data model, schema structure and database instance memory and storage structures. The main focus is learning how to perform basic database operations on enterprise level systems.
Due to the fact that database administration involves a high degree of knowledge in the fields of networking, operating system tuning and scripting, the first part of this course focuses on the practical aspects of datacenter management. The student then learns how to install and configure the different aspects of a database, such as the instance, the storage and the network access.
The last part of this course focuses on advanced topics such as database backup and recovery procedures and data migration.

Advanced Concepts In Database Systems

The course explores advanced concepts of database systems with focus on relational databases. Topics include advanced logical design, principals of physical design, performance concepts, query processing and optimization, architecture, data distribution, and data sharing in relational databases, object database standards, languages and design, object relational and extended relational systems, enhanced modeling, emerging database technologies. Students should be able to demonstrate knowledge about the course topics and database technology, apply the principles and concepts emphasized in the course, assess different architectures, and employ the fundamentals of object and object-relational databases.

Design of J2EE Applications

This course introduces the main concepts and components of the J2EE architecture, as well as development patterns and practical aspects of J2EE applications. The purpose of the course is to: introduce the components of the J2EE architecture, present the relations between these components, introduce patterns for developing J2EE applications, help develop the necessary practical skills for implementing J2EE applications and provide detailed elements which will allow the usage of J2EE applications in solving real problems. The course is accompanied by practical applications whose purpose is to provide concrete examples of the concepts and models presented during the course, to help the students understand better all the aspects of the J2EE architecture, as well as to provide the students with the practical skills needed for developing and running J2EE applications.

Project and IT Services Management

The course aims to: 1) acquiring the knowledge of project management, 2) IT integration into the informational, communication and management processes in economic units and 3) ensuring a competent and professional preparation for a leader position. The course is divided into chapters covering both the commercial, financial and legal framework of the projects and IT services and the project development stages: initiation, planning, execution, monitoring and control, project completion and release resources.
Within application framework, the student is guided to learn in creative and practical manner, he must acquire the necessary knowledge to find applied solutions to problems in development stages of a project and he needs to form practical skills using tools and programs for international project management (e.g. Open Plan, MS Project). Throughout the course is highlighted the role of project manager with his attributes and responsibilities, knowledge and experience in the field and working conditions.

Entrepreneurship, Intellectual Property and Dissemination

Intellectual Property surveys the principal tenets of intellectual property, including trademarks, copyrights, patents, and trade secrets. The course also explores practical aspects of this area of law, such as client counseling and litigation strategy, and theoretical questions of public policy and the interplay of country and EU laws affecting intellectual property. This course aims at preparing students to analyze a wide variety of intellectual property issues at a general level. Dealing with more narrow topics, such as

copyright litigation or patent prosecution, may require additional, specialized study. This class should also help to polish student's legal reasoning skills and introduce students to some of the practical and ethical concerns of a working attorney. Another major objective of the course is to study entrepreneurship with emphasis on personal characteristics, innovation, risk taking, and decision making as related to using land, labor, and capital for attaining organizational objectives, as well as to methods and techniques to identify market opportunities for a potential new venture.

Knowledge Engineering and Services Ecosystems

Knowledge has become one of the most important factors of production in business terms, because the cost of obtaining knowledge and the value of having knowledge have increased. Knowledge is treated explicitly, may be used as a means to obtain social and economic benefits, and, furthermore, knowledge may be used to produce more knowledge. The basic objectives of the course aim at informing students on the activities to acquire knowledge from various sources, to understand it properly, to transform it into a form suitable for applying various knowledge representation formalisms, to encode it in the knowledge base using appropriate representation techniques, languages and tools to verify and validate it and to maintain it over time. This discipline includes the following topics: a comprehensive definition of the knowledge engineering, higher level view of knowledge engineering techniques and modeling, how conceptual modeling relates to knowledge engineering techniques, ontological engineering, knowledge management, sharing knowledge networks and services ecosystems issues.

Research activities

First semester

The research activity for semester 1 is focused on the practical use of theoretical knowledge for the studied graduate courses:

- Advanced Database Systems
- Database Systems Implementation
- Information Systems Security
- Architecture of Service Oriented Information Systems

It also aims to:

- Recognize and correctly representat the problems that can be addressed with domain-specific techniques,
- Appropriate choice of DBMS for a specific problem class.
- Introduction to the proper management of a research project
- Knowledge on a proper preparation of a research report.

Second semester

The research activity for semester 2 is focused on the practical use of theoretical knowledge for the studied graduate courses:

- Data minig and data warehousing
- CASE tools for designing database applications
- Advanced Database Administration
- Advanced Concepts în Database Systems

It also aims to:

- Recognize and correctly representat the problems that can be addressed with domain-specific techniques,
- Appropriate choice of DBMS for a specific problem class.
- Introduction to the proper management of a research project
- Knowledge on a proper preparation of a research report.

Third semester

The research activity for semester 3 is focused on the practical use of theoretical knowledge for the studied graduate courses:

- Design of J2EE applications
- Project and IT Services Management
- Entrepreneurship, Intellectual Property and Dissemination
- Knowledge Engineering and Services Ecosystems

It also aims to achieve R & D activities în order to develop the student's dissertation thesis.
The objectives will be specific for each student depending on chosen dissertation topic.
În this semester the focus is on the management of research activity, applying modern principles of management în IT, developing capabilities în technical writing and those of communication.

Last semester

The research provided în this semester module aims to help în developing theoretical and practical preparation of the dissertation thesis.
The objectives will be specific for each student depending on chosen dissertation topic.

The research activity în this semester is the focusing as the previous one on the management of the research activity, application of modern principles of management în IT, developing capabilities în technical writing and those of communication.

M.Sc. thesis preparation

This activity has as final output the writing and defending the M.Sc. Thesis. The topic of the thesis is choosen by the student from a list of proposed topics, list where all the teachers having courses at this master module contribute from the first semester. The objectives will be specific for each student or small groups of students, depending on chosen dissertation topic.

The general objectives of this activity are:

- Improve team working capabilities. The most part of the topics are not individual ones but for teams of 2 or 3 students.
- Learn how to develop and write a scientific paper describing engineering experiments with both theoretical and practical aspects.
- To correctly apply the rules of ethics în his/her activities.
- Aquire specific skills, depending on the chosen topic.