

Master of Science

Advanced Software Services

Courses description

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.

Cloud Computing

The course covers concepts specific to the Cloud Computing domain, such as Infrastructure as a Service (IaaS), Platform as a Service (PaaS), and Software as a Service (SaaS). It presents aspects ranging from Cloud paradigms and models to technologies used in middleware. The economical models for Cloud Computing, Service Cloud models, the mechanisms and instruments specific to developing and executing Services and Applications in Cloud environments are also presented. Finally, the course will develop the necessary skills to understand concepts related to Business Grid, Cloud Computing, platforms and methodologies to develop services and solutions in Clouds. The practical applications help students develop their skills to 1) understand how to correctly administer Cloud infrastructures and systems; 2) understand how to develop applications and services using specific instruments related to Hadoop and MapReduce (in the first part), and higher-level services provided within Google App Engine (in the second part of

this class). Students are presented with concrete case studies, and they will have the chance to experience the development of practical applications for each of these objectives.

Development of Internet Applications

The course provides knowledge on the development of Internet applications, from the establishment of functional requirements to the proper design and development of specific modules, using current technologies (JEE and .NET Framework). The usual 3-tier model is considered first and then possibilities for the extension to the n-tier approach are analyzed. The widely used MVC (Model View Controller) paradigm is presented. The model component is described, using different techniques and ORM products. The view component is presented focusing on aspects relevant to improving the user experience by using AJAX technologies. The controller component is analyzed through its interaction with other two components, as well as by describing various ways for achieving specific business functions. Other topics related to designing solutions for content and users management, optimization methods to achieve scalable applications, security issues and preventing common attacks and building a set of relevant tests for a Web application are presented. Also, usual ways to interconnect applications using Web services (SOAP and REST) and communication via messages are described.

Foundations of Service Science

The course covers basic aspects of Service Science including service and service systems, value co-creation, Service-Dominant Logic, service modelling and innovation. It investigates the nature of services, the need for interdisciplinary approaches to services innovation, and the technology and tools needed to provide services innovation.

Objectives:

- to help students understand the motivation behind the study of Service Science;
- to help students understand what theories are emerging in the area of Service Science and how to apply them to specific kinds of services;
- to help students understand how enterprises (public, private) are changing organizationally through innovative uses of technology and the implications of these changes;
- to help students understand how social computing technologies are providing innovations in services, specifically providing greater opportunities for co-production;

- to help students approach some techniques for service modelling, including hands-on experience with modelling tool(s);
- to help students understand the general notion of service-oriented computing and how its techniques can be used to architect services.

Business Service Integration and Management

The course presents specific knowledge necessary for integrating business services and then managing and maintaining systems based on them. We discuss the technical background of service integration and its modeling with a standard language, with focus on the way business processes can be mapped to services. Regarding business service management, we study project management specificities for service orientation and the involved life cycle, risk management, and tools. We also consider challenges of existing service systems for maintenance, evolution, modernization and migration towards Service Oriented Architecture and Cloud Computing Environments. For the practical work you will elaborate a portfolio of projects / proposals dedicated to the development of service-oriented systems.

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.

Metodology for consultancy in e-services

This course introduces basic methods for analyzing the effectiveness of e-services designed to support and improve processes in public organizations, using information technology. The course covers three areas of knowledge: modeling organizations and services that allows the definition of e-services to support real needs based on the most advanced technologies in the field of service computing, business performance analysis based on domain specific standards and development of capability and maturity models. Practical applications are organized as project work, done in teams of 3-5 students. The students have to conduct an analysis of a sistem/service, based on quality standards. Within the application hours, the students will have developpe an audit plan and a compliance analysis of an ISMS, according to ISO 27001, as well as a technical bid based on requirements specified in a specification. The course contributes to the professional and transversal competences necessary for future computing services consultants, auditors, architects of e-services for e-government.

Policies in Distributed Systems

Distributed systems are growing dramatically in size and complexity, which pose major challenges into how to reason about their behavior and how to manage them. In this class, we present the main concepts of defining and enforcing policies in such large systems. First an overview about the specification models and their efficient enforcement is given. Then we will talk about access control policies and discuss the most important existing models, both in industry and research: matrix model, RBAC with its variations, OASIS, Ponder, LGI, etc.

In the second part of the class we will discuss about workflow management systems and policies, with specific examples. Lastly, we will talk about applications of workflow policies to WEB Services, such as BPEL.

Information Security

This course addresses different research topics regarding information security. It is focused on data security, authentication and authorization, intrusion detection and the security of different types of distributed systems. During the semester the courses consist of the study of well known security techniques and methods to ensure a good level of security, as well as the analysis of current research papers and recent advances regarding

these topics. At the end of the semester the students should have a good understanding of different advanced security mechanisms, as well as some practical experience, due to a group project which involves the analysis and development of different security techniques.

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 its 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.

Research activities

The research activity in Advances Software Services is focused on the application of theoretical and practical knowledge acquired in the MSc program to the study of the state of the art in the domain, and to the development of original solutions for advanced software service and platforms. The objectives are the identification and correct representation of actual problems, their approach using specific techniques and methods in the domain, selection of adequate instruments for the specific class of selected problems. The development of skills for the correct management of a research project and for editing a research paper will be other important objectives. The activity will include: discussion and selection of the research subject, documentary research and elaboration of the state of the art, problem identification, solution development, solution evaluation and presentation of results, elaboration of the final research report.