Πανεπιστήμιο
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NEAPOLIS UNIVERSITY PAFOS

SCHOOL OF INFORMATION SCIENCES

GUIDE

POSTGRADUATE PROGRAMME
IN INFORMATION SYSTEMS
(in short **MSCIS)**

PAFOS 2015

Table of Contents

Guide of the Postgraduate Programme in Information Systems (MSc in Information Systems, MScIS)

This guide contains details of the Postgraduate Programme in Information Systems (IS). The programme has a modular design to serve a multitude of needs and corresponding objectives, ranging from the advancement of the pure scientific and technological knowledge on IS and Information Technologies (IT), to the extend IS and IT disciplines and technologies are applied and promoting other knowledge areas, such as business, health, government, economy, etc.

The aim of the MScIS Programme is to provide a course of advanced study to those who aspire to become effective leaders in the public and private sectors. The information and Communication Technology (ICT) sector continues to be a significant engine of growth and a key enabler to other sectors of the economy. However, recent trends indicate that simply being skilled in hardware or software development is no longer sufficient to thrive in this fast-paced industry. Consequently, while there exist opportunities for ICT professionals, a fundamental shift in required skill sets comprising both advanced IT skills and software skills that are focused on management and user-centered design has occurred. Thus, programming skills alone are no longer sufficient. Instead, an ICT professional requires a mixture of technical know-how and skills such as from information management, information security and information discovery etc. The MSc in Information Systems Programme at NUP is designed to address the needs of all these braches of science and engineering in the area of managing and manipulating their scientific data, which grow enormously from year to year.

Thus, the program is designed in such a way that one of its tracks, more specifically the ***advanced track***, is designed in a way to fill this gap and educate ICT professionals to play a significant role in the new ICT environment in Cyprus and abroad. At the same time, is increasingly evident that ICT plays an important role in almost all scientific disciplines, namely Humanities, Social Sciences, Natural Sciences, Formal Sciences, as well as interdisciplinary and applied sciences, such as Engineering and Medicine. Today, the aforementioned sciences are making excessive use of ICT in promoting their field. The programme's curriculum, through an ***applied track***, comes in support of these professionals providing them with all the essential knowledge on ICT, and more specifically on Information systems, in order to become capable to explore ICT techniques directly themselves in manipulating their scientific data in most circumstances, rather than through an ICT professional.

The core curriculum of either track emphasizes both the skills and knowledge required to effectively manage, manipulate, mine, discover and safeguard data. Through elective courses the students may acquire a specialization in the areas of IS security, intelligent manipulation of data, and electronic services provisioning. Additional electives allow the students to get acquainted with state-of-the-art developments in the area of information systems, such as grid and cloud computing.

The programme provides up-to-date knowledge in a number of diverse areas that comprise the field of Information Systems such as analysis and design of IS, Web technologies and programming, data mining, intelligent data manipulation, IS and data security, enterprise models, and service-oriented architectures for building up electronic services. In addition, via courses on IS project management and research methods, the programme equips students with technical, analytical, critical, ethical, accountability, and leadership skills to enhance their decision-making ability and to promote organizational well-being within the context of a continually changing and competitive technical and economic environment.

The programme brings together theory and practice and aims to equip students with advanced knowledge that is essential for the design, development, maintenance, and management of information systems. Such training includes exposure to the latest technologies used in the development of information systems, as well as core skills required to cope with the rapidly changing nature of the field.

To this end, the MSc IS programme is broad-based and covers a range of technical and software skills that an Information Systems professional is expected to possess. Broadly, these skills are categorized as:

Software Development and Infrastructure	Provides students with a core of knowledge required for the design, development, and maintenance of Information Systems.
Electronic Services	Provides students with the knowledge for designing information systems for providing e-services to the public that are both useful and usable from an end-user perspective.
Intelligent Information Manipulation	Provides students with skills needed to store, organize, preserve, and manipulate information in a way that allows for its reliable, meaningful and accurate retrieval and use.
Information Systems Security	Provides students with an understanding of the threats posed to networked information systems and the knowledge required to secure them.
Management of Systems and Services	Provides students with software skills required for managing information systems projects, information systems personnel, and resources.

A fundamental philosophy of the programme is its empirical approach to the study of Information Systems, where the acquired new knowledge and skills are blended with the participants' experience and are applied from the beginning to real-life scenarios.

This approach broadens and deepens student understanding of management and technical issues and processes; it foster skills of research, analysis, synthesis and creativity; and it encourages innovation and awareness of the role of information and technology in innovation. Finally, it develops awareness of ethical, social, environmental and global issues affecting management decisions.

LEARNING OUTCOMES

The overall learning outcome for students completing the Master of Information Systems is to develop a broad conceptual understanding of the theory and practice of Information Systems. At the end of the course students shall therefore have:

- the ability to think laterally, critically, innovatively, creatively, and to make connections among diverse fields of study in analyzing problems related to Information Systems setup and operation;
- a global perspective based on an understanding of both the technical and managerial issues of an Information System within an Enterprise;
- the ability to apply security measures, procedures and policies for the IS on an organization;
- the ability to critically evaluate new technological developments in the area of Information Systems and to suggest changes and/or adaptations of them;
- the ability to lead and to interact effectively in group situations and to manage in culturally diverse environments;
- gained experience in applying qualitative and quantitative methods to research questions related to Information Systems;
- achieved substantial competency in Information Systems analysis and design, and in management and administration techniques of them; and
- developed skills related to critical thinking and autonomous learning;
- developed communication, and teamwork skills.

PROGRAMME STRUCTURE

The preceding description of the students addressed by the Programme puts in perspective its proposed structure.

Students of the Programme

The programme is addressed to three (3) categories of students:

1. Students with solid undergraduate background on IS and IT, such as graduates of Computer Science, Computer Engineering, Computer Communications and Information Systems, who give priority in further advancing their IS/IT knowledge.
2. Students with some minimal knowledge on IS/IT, either through formal studies or through professional practice on IS/IT, who want to acquire a more solid knowledge on IS, combined, with the application of IS to the business/enterprise domain. Normally, these students are BSc, BA, BBA graduates in Business (or Finance, or Economics), but also students of category (1) who wish to complement their IS knowledge, rather than advancing this any further, in order to apply their complemented knowledge to the IS Business domain.
3. Students with any kind of formal undergraduate studies and minimal IS/IT knowledge, who want to apply IS disciplines and practices to their own scientific area. Normally, these students are BSc, BA graduates in other Sciences, Liberal Arts or Humanities. Normally, these students come from an academic or a professional

work environment. Typical examples are research scientists, civil servants, private-sector employees and teachers. Students of this category may have to obtain one or two undergraduate introductory courses based on the course coordinator's approval, in order to ensure successful completion of their studies.

In fact, students from the categories (2) and (3) follow similar tracks in the programme, a curriculum that provides them with some foundational knowledge on IS, and then through electives, they are allowed to attain the specialty they wish. Electives are also introduced for all student categories. Students can be specialized in technical areas of IS, which are identified by the type of electives chosen. Examples of these specializations areas include,

- IS Security
- Intelligent Systems
- Electronic Services

A minimum of three (3) elective courses need to be undertaken within a specialization area for the acquisition of a specialized degree.

Students of categories (2) and (3) follow similar tracks in the programme, namely a curriculum that provides them with some foundational knowledge on IS, and subsequently they can acquire specialized knowledge by selecting a number of electives.

Effectively, the above three categories of students map to the following two different threads of study.

Programme Threads

The programme attains the above multifaceted objective by structuring its curriculum into two main tracks of study providing additional elective courses that satisfy the students scientific and career objectives. Effectively, the curriculum of the programme is distinguished into two tracks of study, corresponding to the above categories of students. The attained track name will appear on the issued MSc certificate of studies, as well as on the transcript.

Track 1 (advanced IS): This is a highly technical IS thread normally taken only by students with background of type (1). The purpose of this track is to advance the scientific knowledge and technical skills of the students on the analysis and design of IS. The students of this track may specialize in some area of IS/IT by selecting a number of electives from a specialization area (currently a minimum of three (3) electives). Students may also take elective courses directly related to the organizational aspects of an enterprise.

Track 2 (applied IS): This is a foundational IS and IT thread which can be combined with electives on disciplines related to the background knowledge and/or career objectives of the students. In this way, students of this track acquire initially a foundational knowledge on IS/IT, allowing them to specialize in some application area of IS/IT of his/her interest. The IS foundation courses are four (4), and cover in breadth rather than depth the fundamentals of IS/IT. In this way the students build a solid CS background and become capable to attend the other three (3) electives.

Courses of the Programme

The courses are divided in two, orthogonal ways, according to two criteria:

- Level of IS/IT specialization (breadth vs. depth)
- IS/IT Application area

The courses of IS/IT specialization are distinguished to two levels:

- **Level 1** (L1) corresponds to broader advanced graduate courses;
- **Level 2** (L2) corresponds to deeper graduate courses

There are only four (4) L1 IS/IT courses that are foundational and compulsory for students that fall into categories (2) and (3) (as described above) during the 1st year of study. These courses are characterized as Level 1; since they cover breadth of knowledge on IS/IT issues. The remaining courses are all Level 2 courses (compulsory and electives), irrespective of the subject they cover. They are characterized as Level 2 courses since they cover various IS/IT subjects in depth. Both L1 and L2 type courses are at an appropriate postgraduate level, as far as learning difficulty and learning outcome, the former due to the breath of knowledge they convey, the later due to the depth of knowledge they offer.

Semester Structure

The MSc Programme of study is organized in one-semester individual courses (15-week including reading period and examinations), each typically carrying 10 ECTS (~250 hours of total student work). Thus a typical student can complete the MSc Programme in 4 semesters or 12 courses. The table below shows the curriculum structure (full-time version) of the two tracks in terms of course level (L1, L2), compulsory (core) courses (C_{ij}), Electives ($Elective_{ij}$) and the Thesis.

	Winter semester		**Spring semester**	
	Track 1	**Track 2**	**Track 1**	**Track 2**
1st Year	C_{11} of L2	C_{21} of L1	C_{13} of L2	C_{23} of L1
	C_{12} of L2	C_{22} of L1	C_{14} of L2	C_{24} of L1
	C_A of L2	C_A of L2	C_B of L2	C_B of L2
2nd Year	$Elective_{11}$	$Elective_{21}$	$Elective_{13}$	$Elective_{23}$
	$Elective_{12}$	$Elective_{22}$	Thesis	Thesis
	Thesis	Thesis		

Based on the above table the design of the programme is as follows:

- All courses (L1, L2, Electives) are of 10 ECTS. For each course are foreseen 10 weekly pass/fail exercises (with 1 ECTS load) and two project-like homework - HW (each of 1 ECTS) evenly spread during the term. The actual body of the course counts for the remaining 7 ECTS load, representing a load of 170 to 210 study hours.
- In the 1st year the student takes three specific core courses C_{ij} per semester. The courses have been chosen carefully to ensure that the student acquires essential knowledge irrespective of the specialty (specialty is only applicable to students of

Track 1). Specialization will be made explicit during the 2nd year of the programme. Two of these courses are common to both tracks.

- In the 3rd semester the student chooses two (2) electives and in the 4th semester only one (1) in order to concentrate in preparing and completing the Thesis.
- The Thesis is spread in two semesters with 30 ECTS in total (10 ECTS on the 3rd semester) and 20 ECTS on the 4th semester). The Programme considers that the thesis should be of high quality, and thus the appropriate effort /ECTS should be allocated to it.
- For practical purposes (in order to reduce the number of different courses that must be offered during the winter semester) the $Elective_{23}$ may be chosen from the set { C_{21} , C_{12} , { $Elective_{11}$, $Elective_{12}$, …. }}
- For practical purposes (in order to reduce the number of different courses that must be offered during the spring semester) the $Elective_{21}$ may be chosen from the set { C_{13} , C_{14} , { $Elective_{13}$, …. }}

The last two provisions above imply that a 2nd year student who follows Track 2 may attend as elective a course taken by a 1st year student of Track 1. This effectively gives the opportunity to reduce the different courses that need to be offered during each semester.

Understandably, the introduction of electives increases the number of different courses to be offered and may have as a result more groups of students, and effectively the need to organize more lecture courses and exams. There are various ways to alleviate this problem e.g., by reducing the number of electives, by employing IT e-teaching technologies, i.e., tele-classes, tele-presence, virtual classes and labs. Such a programme, once accepted in principle by the University, may require the use of some form of distance educational methodology and technology.

Course Allocation

The following Table provides details of the proposed courses, according to the above analysis. The content of the courses is given in subsequent sections. However, it will be finalized once the Programme gets its approval by the ECPU. In addition to the materials mentioned, additional learning material (but not books) will be developed by the respective Lecturers and made available over the courses Web sites.

	Track 1	**Track 2**	**Track 1**	**Track 2**
1st Year	Analysis and Design of Information Systems	Data Structures, Algorithms & Programming Principles	Data Mining	Intelligent Systems
	Advanced Web Technologies and Programming	Web Programming	Communication Networks	Communications and Computer Networks
	IS Project Management	IS Project Management	Research Methods	Research Methods
2nd Year	$Elective_{11}$	$Elective_{21}$	$Elective_{13}$	$Elective_{23}$
	$Elective_{12}$	$Elective_{22}$	Thesis	Thesis
	Thesis	Thesis		

Electives and Specializations

The electives are classified into two major categories, namely, Specialization Groups and other Electives. Students can select electives from both categories with the following restrictions:

- Students of Track 1 can choose one (1) of the three specialization groups by selecting the three (3) electives from the same specialization group, leading to a specialized degree certification.

- Students of Track 2 can choose **only** the Electronic Services specialization group by selecting all three (3) electives of it, leading to that specific specialized degree certification.

Note that specialization is **not** compulsory. This means that a student may select the three required additional courses for graduation from any group. Also, note that students of Track 2 may select as an elective, a compulsory course of Track 1, or an elective from the specialization groups IS Security or Intelligent Systems; some of them subject to approval of their study advisor (see Table 1 below)

Specialization Groups

a. IS Security (ISS)

i. Computer and Network Security
ii. Cryptography
iii. IS Security Risk Management

b. Intelligent Systems (IntS)

i. Autonomous Agents and Multi-Agent Systems
ii. Collective Intelligence
iii. Knowledge Engineering

c. Electronic Services (e-services, e-S)

i. e-Commerce Fundamentals and Development
ii. Enterprise Models
iii. Service Oriented Architectures (SOA)

Other Electives

These electives may be taken by either Track

i. Human Computer Interaction
ii. Software testing and Quality assurance
iii. Enterprise Information management
iv. Advanced Distributed Systems

Table 1. - Track 1 & Track 2 Compulsory Modules and Electives

	Module Name	Track 1 compulsory Modules	Track 2 compulsory Modules	Electives Track 1 (1) Track 2 (2)
IS1	Advanced Distributed Systems Προηγμένα Κατανεμημένα Συστήματα			1, 2
IS2	Advanced Web technologies and Programming Προηγμένες Τεχνολογίες Ιστού και Προγραμματισμός	X		2*
IS3	Analysis and Design of Information Systems Ανάλυση και Σχεδίαση Πληροφοριακών Συστημάτων	X		2*
IS4	Multi-Agent Systems Συστήματα Πολλών Πρακτόρων			1, 2*
IS5	Collective Intelligence Συλλογική Νοημοσύνη			1, 2*
IS6	Communication Networks Δίκτυα Επικοινωνιών	X		2*
IS7	Communications and Computer networks Επικοινωνίες και Δίκτυα Υπολογιστών		X	
IS8	Computer and Network Security Ασφάλεια Υπολογιστών και Δικτύων			1, 2
IS9	Cryptography Κρυπτογραφία			1, 2*
IS10	Data Structures, Algorithms and Programming Principles Δομές Δεδομένων, Αλγόριθμοι και Προγραμματισμός		X	
IS11	Data Mining Εξόρυξη Δεδομένων	X		2*
IS12	E-Commerce Fundamentals and Development Ηλεκτρονικό Εμπόριο			1, 2
IS13	Enterprise Information Management Διαχείριση Επιχειρηματικών Πληροφοριών			1, 2
IS14	Enterprise models Επιχειρηματικά Πρότυπα			1, 2
IS15	Human-Computer Interaction Αλληλεπίδραση Ανθρώπου Υπολογιστή			1, 2
IS16	IS Project Management Διαχείριση έργων Πληροφοριακών Συστημάτων	X	X	
IS17	IS Security Risk Management Διαχείριση κινδύνων ασφάλειας Πληροφοριακών Συστημάτων			1, 2
IS18	Intelligent Systems Ευφυή Συστήματα		X	
IS19	Knowledge Engineering Τεχνολογία Γνώσεων			1, 2
IS20	Research Methods Ερευνητικές Μέθοδοι	X	X	
IS21	Service Oriented Architectures Υπηρεσιοστρεφείς Αρχιτεκτονικές			1, 2
IS22	Software Testing and Quality Assurance Έλεγχος Λογισμικού και Διασφάλιση Ποιότητας			1, 2
IS23	Web Programming Προγραμματισμός Ιστού		X	
IS24	Thesis Διατριβή	X	X	

* Requires approval by the Study Advisor *Απαιτείται άδεια του Συμβούλου Σπουδών

COURSE CONTENT

IS1 - Advanced Distributed Systems

Introduction (Features and types of distributed systems), Architecture (Architectures, middleware, and self-management in distributed systems), Processes (Multithreaded clients and services, virtualization and virtual machines, and code migration), Communication (RPC-, message-, and stream-oriented communication and multicast communication), Naming (Flat and structured naming, and attribute-based naming), Synchronization (Synchronization algorithms), Consistency and Replication (Consistency models and replica management), Fault Tolerance (Failure models, failure detection, algorithms for fault tolerance, and recovery from failure in distributed systems), Security (Distribution of security mechanisms, access control, and security management), Introduction to Cloud Computing (Analyzing cloud service models, designing distributed applications based on a cloud platform, and deploying computing resources and running services in the underlying cloud infrastructure), VM Provisioning and Migration for Cloud Infrastructures as a Service , IaaS **(**Virtual machine provisioning and migration services for cloud infrastructures; deploying and running workflow applications on multiple virtual instances and clouds), Cloud Platform and Software as a Service (PaaS/SaaS) (Analyzing on multi-level interoperability of clouds across distributed infrastructure and across multiple heterogeneous and distributed resources (services and data centers).

IS2 - Advanced Web Technologies and Programming

Introduction to Web applications and review of basic concepts: client-server architecture, three- and n-tier models, static versus dynamic pages, server-database connectivity. Client-side technologies: HTTP protocol, HTML and related (CSS, JavaScript, etc.). Java Servlet programming. JavaServer Pages (JSP) and concept of tag libraries. Server-database connections using Java Database Connectivity (JDBC). Using formal methods in the development of Web applications. Review of key features of Java relevant to Web applications. The Model-View-Controller (MVC) paradigm. Overview of JavaServer Faces (JSF). JSF managed beans and navigation. JSF components and tag libraries. JSF event handling. JSF and external sources.Web Services using RESTful.

IS3 - Analysis and Design of Information Systems

Systems development methodologies including life cycle and iterative design models; development phases including systems selection and planning, analysis, logical design, physical design, implementation and operation, maintenance. Techniques for requirements determination, collection, and organization (questionnaires, interviewing, document analysis, observation); joint application design (JAD) and other group approaches (e.g., electronic JAD, computer conferencing); prototyping. Team organization and communication; interviewing, presentation design, and delivery; group dynamics; and leadership. Project feasibility assessment and risk analysis. Design reviews and structured walkthroughs.
Systems development life cycle; object-oriented analysis and design; Rapid Application Development (RAD); eXtreme programming; prototyping. Core UML diagrams; principles underlying the widely used object-oriented process models. Data organization and design: conceptual data modeling; logical data modeling using relational technologies; database definition and manipulation using SQL. Software and system quality metrics. Application categories.

IS4 - Multi-Agent Systems

Intelligent Agents. Multi-agent Systems. Distributed Problem Solving and Planning. Search Algorithms for Agents. Group Decision-Making. Multi-agent System Design and Programming. Learning in Multi-agent Systems. Logic-Based Representation and Reasoning Industrial Deployment of Multi-agent Systems.

IS5 - Collective Intelligence

Introduction to Collective Intelligence. Making Recommendations. Discovering Groups. Searching and Ranking. Optimization. Document Filtering. Modeling with Decision Trees. Building Price Models. Advanced Classification: Kernel Methods and (Support-Vector Machines) SVMs. Finding Independent Features. Evolving Intelligence. Algorithms covered: Bayesian Classifier, Decision Tree Classifier, Neural Networks, Support-Vector Machines, K-Nearest Neighbors, Clustering, Multidimensional Scaling, Non-Negative Matrix Factorization, Optimization.

IS6 - Communication Networks

Data Communications, data Networking and the Internet. Protocol Architecture and TCP/IP Data Transmission, Transmission Media. Signal Encoding Techniques and Digital Data Communication Techniques. Multiplexing, Spread Spectrum. Circuit Switching and Packet Switching. Routing, Congestion. Cellular Wireless Networks. Local Area Networks, Ethernet, Wireless LAN's. Internetwork Protocols, Internetwork Operation. Internet Quality of Service. Transport Protocols. Network Security.

IS7 - Communications and Computer Networks

Introduction to Computer Networks and the Internet. Application Layer. Application Layer Programming. Transport Layer Overview. Network Layer. Wireless and Mobile Networks. Wireless and Mobile Networks / Multimedia Networking. Wireless and Mobility: Impact on Higher-layer Protocols. Multimedia Networking Applications, Streaming Stored Audio and Video, Accessing Audio and Video Through a Web Server. Multimedia Networking. Making the Best of the Best-Effort Service, Content Distribution Networks, Dimensioning Best-Effort Networks to Provide Quality, Protocols for Real-Time Interactive Applications. Network Management.

IS8 - Computer and Network Security

Introduction to network security. Cryptography. Security-related legislation. Security policies Access Control. Computer threads and defense tools. Network defense tools. Application Security and Protocols. Operating Systems Security.Wireless Security. Penetration Testing, Security Assessment.

IS9 - Cryptography

Introductory overview of cryptography and its history. Private key (or symmetric) cryptography. DES (Data Encryption Standard). Public key cryptography. The RSA algorithm. Electronic voting: a non-cryptographic solution. Electronic voting: Prêt à Voter Authentication and secrecy protocols. Attacks on security protocols.

IS10 - Data Structures, Algorithms and Programming Principles

Introduction to C. Recursion. Analysis of Algorithms. Lists, Trees. Graphs. Sorting.

IS11 - Data Mining

Data Pre-processing. Overview of Data Warehousing and OLAP. Data Cube Computation and multi dimensional data analysis. Mining Frequent Patterns, Associations, and Correlations. Classification. Cluster Analysis. Outlier detection.

IS12 - E-Commerce Fundamentals and Development

Introduction to E-business and E-commerce. Modeling for E-business. E-business Infrastructure and Services. Capacity Planning for E-business. Methodology for Characterizing E-business Systems Workloads. Application Cases. Introduction to Legal, Ethical, and Social Issues.

IS13 - Enterprise Information Management

Introduction. Data Modeling: Basics. Data Modeling: Diagramming. Data Modeling: Normalization. SQL. Management: Performance management and capacity planning. Management: Security and Fault Management. Beyond the Relational Database Management System (RDBMS): Web and Cloud Issues. Beyond the RDBMS: no SQL. Personal Research Project Initiation. Presentations and portfolio assembly.

IS14 - Enterprise Models

A strategic view of processes; concepts of organizational efficiency and effectiveness. Integrating the functional areas of the organization. Relating processes to the financial, customer, and product-oriented goals of the firm. Process innovation: analysis, modeling and simulation. Business process automation. Using Activity Diagrams and Business Process Modeling Notation (BPMN) for business process modeling. Business Process Modeling tools Job redesign; impacts of automation on work practices. Achieving security and process compliance. Monitoring and controlling processes. Supply chain management (SCM). Customer relationship management (CRM). Enterprise management systems (EMS). The process continuum: from structured to unstructured processes. Collaborative systems. Knowledge management systems. Processes that span the world; global virtual markets.

IS15 - Human Computer Interaction

Human-computer interaction (information processing paradigm, cognitive models, memory, attention, visual perception, and their implications for design); User-centered design (scenario, user requirements, conceptual design, prototyping and envisionment, evaluation); Usability evaluation (usability and user experience, designing a usability study, formative and summative usability tests, usability evaluation techniques). Hypertext (link, node, anchor, link following and navigation); the Web (Web architecture, HTTP, URL, HTML, Web 2.0 and its characteristics, a five-plane user experience framework, types of web site); Information architecture design (Web as hypertext, organization structures, meta data, top-down and bottom-up approaches); user interaction design (Web as software interface,

conceptual models, error handling); Information design (convention, metaphor); navigation design (activities and goals of navigation, signage and labeling, site map, index, searching, social navigation); user interface (UI elements of Web pages, element selection and arrangement); wireframe; Visual design (follow the eye, contrast and uniformity, consistency, color palettes and typography, design comp and style guide). State-of-the-arts interactive system technology (agent-based interaction, ubiquitous computing, distributed information space, CSCW and groupware). Group work and hands on practice (Web design and analysis using Google sites and Google analytics; Groupware design and evaluation using the PowerMeeting system as test bed).

IS16 - IS Project Management

Introduction to Project Management. The Project Management Lifecycle. Managing Project Teams. Managing Project Communication. Project Initiation and Planning. Managing Project Scope. Managing Project Scheduling. Managing Project Resources. Managing Project Quality. Managing Project Risk. Managing Project Procurement. Project Execution, Control & Closure. Managing Project Control & Closure.

IS17 - IS Security Risk Management

Security principles and techniques. Security risk assessment/management frameworks. Security risk management process. Threat assessment. Vulnerability assessment. Security risk analysis. Security risk mitigation. Security policies. Security risk assessment reporting. Related standards, procedures and legislation.

IS18 - Intelligent Systems

Expert systems. Logics. Fuzzy logic and fuzzy systems. Introduction to clustering. Neural network-based knowledge representation and inference. Hybrid Approaches. Data modeling, metadata standards and repositories. Ontologies and reasoning services. Intelligent systems architecture. Applications (the following list contains some application areas that we may look at during the course depending on students' interests). Reasoning about knowledge: modeling knowledge in multi-agent systems (including common and distributed knowledge, agreement), describing the behavior of a system by using the knowledge of the participating agents. Semantic web: ontologies; description logics as ontology languages; consistency checking of ontologies; reasoning about ontologies.

IS19 - Knowledge Engineering

Propositional Logic. First-Order Logic. Knowledge Engineering. Drawing Inferences through Resolution. The Case of Horn Logic. Forward and Backward Chaining. Basics of Programming in Logic. Encoding Default Knowledge. Temporal Reasoning and Planning.

IS20 - Research Methods

The nature of scientific research. Research approaches – the research problem. Reviewing the literature. The Hypothesis in Quantitative Research. Descriptive statistics. Sampling and inferential statistics. Fundamentals of measurements (tools, validity and reliability). Research methods (Experimental, Ex Post Facto, Correlational, Survey, Qualitative, Action, Mixed). Communicating research (writing proposals, research papers, presenting results).

IS21 - Service Oriented Architectures

Distributed Components: Java Remote Method Invocation (RMI), Basic Standards for Web Services: Web Services Model, Universal Data Format – XML, Service Interactions – SOAP, Service Description Language – WSDL, Service Registry – UDDI. Representational State Transfer (REST) Services: REST Architectural Style, REST Concepts – Resources, Verbs, Representations, REST Service Interactions – HTTP, REST Resource Representations – XML, JSON, REST Resource Naming – URI. Service Oriented Computing: Enabling SOA. Enterprise Architectures: Enterprise Integration – EI, Java 2 Platform Enterprise Edition – J2EE, Microsoft .NET Framework, Model Driven Architecture (MDA). Model Driven Architecture: Enabling SOA. SOA and WSDL Extensions: Activity Management and Composition, Advanced Messaging, Metadata and Security. Cloud Computing.

IS22 - Software Testing and Quality Assurance

Software Quality Concepts. Code-based Testing Techniques. Specification-based Testing Techniques. Inspection Technique. Management of Software Quality.

IS23 - Web Programming

Introduction to the Internet and the WWW: architecture; network topologies; devices; protocols; addressing; hypertext concepts; Web browser functionality; Web security issues; cookies. HTML: the basic document structure; lists; hypertext links; tables; images; frames; forms; targeting different window sizes. CSS: the Document Object Model; style attributes; maintaining style across complete Web sites. JavaScript - manipulating the Document Object Model dynamically (DHTML). XML: separating data from layout markup; DTDs, AJAX: basic principles and use of Ajax.

IS24 - Thesis

By the end of the MSc Thesis the students are expected to be able to: competently address one current problem in the broad area of Internet Computing, Information or Communication Systems; describe and critically evaluate existing literature relevant to their topic thus demonstrating expertise in their field; apply the concepts, techniques and methods they learned from the taught element of the course in order to design a solution (typically a software system) for their chosen problem; critically evaluate software tools and environments and choose the right combination in order to implement (fully or partially) their design; assess their system by using appropriate metrics such as performance, user acceptance and feedback, security, etc. demonstrate competence in applying the concepts of software lifecycle and systems analysis and design in all stages of the development of their system; professionally present technical findings in written and spoken form.