



**HELLENIC REPUBLIC
UNIVERSITY OF THESSALY
POLYTECHNIC SCHOOL**

DEPARTMENT OF ELECTRICAL AND COMPUTER ENGINEERING

MSc: "Applied Informatics"
(MSc in Applied Informatics)

STUDY GUIDE

POSTGRADUATE PROGRAMME

"Applied Informatics"

Academic year 2022-23

November 2022

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1 Purpose of the Guide

The Study Guide of the Postgraduate Studies Programme (MSc) "Applied Computer Science" of the Department of Electrical and Computer Engineering (ECE) of the University of Thessaly (UTH), is addressed to the undergraduate students of the Department and to all interested parties regarding the MSc and the basic rules governing its operation. Its main objective is to provide them with accurate information about the education provided in the programme. Through its content, the student has the opportunity to see in detail the objectives of the Department for the Postgraduate Studies Programme, the structure of the programme, the lecturers, the available material and technical infrastructure and the services provided to support its operation. The curriculum and a brief description of the course content help students to organise their studies properly and effectively. The curriculum guide is updated on an annual basis or on an ad hoc basis whenever appropriate.

For the operation of the Postgraduate Studies Programme, the Internal Regulations of the Postgraduate Studies Programme apply, which are specified for study issues by the Regulations of the Postgraduate Studies Programme.

2 Introduction

2.1 Brief presentation of the institution and department

The University of Thessaly was founded in 1984 by the Presidential Decree 83/1984, which was amended in 1985 by Presidential Decree 302/1985 and Presidential Decree 107/86.

The University of Thessaly, like all Greek Universities, is a Public Law Entity, fully self-governing, under the supervision of the Ministry of National Education and Religious Affairs in accordance with the provisions of Article 16 of the Constitution and the applicable legislation. The administrative bodies of the University are (according to Law 4957/2022):

- The Management Board.
- The Senate.
- Dean.
- The Vice Rectors.
- The Executive Director.
- The Rector's Council.

The governing bodies of the Faculty of Engineering are:

- Dean:
- The Deanship.

The Department of Electrical and Computer Engineering of the Faculty of Engineering of the University of Thessaly is located in Volos. It was founded in March 2000 as the Department of Computer, Telecommunication and Network Engineering, and accepted its first students in September of the same year. In June 2013 it was renamed as the Department of Electrical and Computer Engineering (ECE). The Department now accepts about 200 undergraduate and 50-60 postgraduate students every year.

Since its establishment, the Department's constant objectives are:

- The promotion of theory and technologies in the fields of Circuits, Electronics and Computer Architecture, Software and Informatics, Telecommunications and Networks, and (after its renaming) Energy.
- The training and preparation, both through teaching and research, of engineers with all the necessary skills, both ethical and technological, that will allow them to successfully participate in postgraduate programmes, to support professionally the design and implementation of projects and to follow the developments in the constantly evolving fields mentioned above.
- The continuous production of new knowledge through cutting-edge research in the above fields, not only at national but also at international level, and the training of new researchers who will in turn promote science at national and international level.

To this end, at the undergraduate level, the Department covers the scientific subject of Electrical and Computer Engineering through a 5-year curriculum, offering a wide range of courses in the following main areas: (1) Foundations and Applications of Computer Science, (2) Software and Information Systems, (3) Computer Hardware and Architecture, (4) Signals, Telecommunications and Networks, and (5) Energy. Since 2019, with the Government Gazette 454/15.02.2019 issue B', the Diploma in Electrical and Computer Engineering awarded by the Department is recognized as a single and indivisible degree of postgraduate level (integrated master).

At the same time, the Department offers three separate postgraduate programmes in the following subjects:

- Electrical and Computer Engineering Technology and Science
- (<https://www.e-ce.uth.gr/studies/postgraduate/science-and-technology-of-ece/>)
- Intelligent Electricity Networks
- (<https://www.e-ce.uth.gr/studies/postgraduate/smart-grid-energy-systems/>)
- Applied Informatics
- (<https://www.e-ce.uth.gr/studies/postgraduate/applied-informatics/>)

In addition, the Department operates a Doctoral Studies Programme (D.Sc.) leading to the award of a Doctoral Degree (D.Sc.) in Electrical and Computer Engineering.

The governing bodies of the T.H.M.M.Y. are:

- The Assembly
- The President
- The Vice-President

Infrastructure of the ECE Department

From the academic year 2021-22, the Department will be housed in the new facilities at the Areos Field in close proximity to the other departments of the School of Engineering.

The new building has 1 large auditorium (260 seats), 2 smaller auditoriums (130 seats each) and 3 classrooms (55 seats each). In addition, it has 4 laboratories, 34 offices for teaching staff, additional offices for technical staff and the Secretariat, and 1 conference room .

2.2 Research activity section

A large part of the research work is carried out through separate research laboratories, involving post-doctoral students, PhD students, postgraduate students and undergraduate students.

The Department has seven institutional (1-7) and two non-institutional research laboratories (8-9):

1. Electronics Laboratory
2. Circuits and Systems Laboratory
3. Intelligent Energy Strategy and Networks Laboratory
4. Telecommunications and Networks Laboratory
5. Computer Systems Laboratory
6. Building Technologies and Data Processing Laboratory
7. Creative Learning Technologies
8. Distributed and Network Algorithms Laboratory
9. Signal Processing Laboratory

3 Object and purpose of the MSc programme

The Department of Electrical and Computer Engineering (ECE) of the University of Thessaly organizes from 2018 a Postgraduate Studies Programme (MSc) with the title "Applied Informatics" (Applied Informatics) leading to the award of the Diploma of Postgraduate Studies (MSc in Applied Informatics).

The objective of the Postgraduate Studies Programme (MSc) "Applied Informatics" is the high level scientific, theoretical and applied specialization of the holders of the first cycle of the first cycle of studies of higher education institutions. of the domestic or similar institutions of foreign countries, on issues related to the cognitive subject of the program, on the one hand, to meet the increased professional demands of the labor market in relevant fields, and on the other hand, to form an appropriate scientific background for the continuation of studies at a higher level as a result of research and deepening of knowledge in relevant scientific fields.

The MSc in "Applied Informatics" provides students with:

- Specialised training in Computer Science and its applications.
- Advanced education and training on issues related to Software, Computer Hardware, Networks, Information and Communication Technologies in Education, Information Systems Security.
- Deepen the knowledge and skills needed in competitive work environments.
- Necessary knowledge and skills to make good decisions in the constantly developing and changing work environment through further research and study.
- The opportunity to acquire specialised scientific knowledge and skills on issues related to the programme's subject matter, in order to develop their ability to analyse and solve problems, as well as to take decisions and initiatives in a local or international environment.
- The necessary scientific infrastructure for the participation and monitoring of Doctoral Studies in relevant areas of the programme's cognitive object or areas that use or are interrelated with the science of Computer Science.

4 Enrolment in the MSc.

4.1 Enrolment in the postgraduate programme

The initial enrolment in the Department's MSc is made at the beginning of the academic semester, following a decision of the Board of Directors and an announcement by the Secretariat of the MSc.

At the time of initial registration, Postgraduate Students (G.S.) submit, in addition to the documents submitted with their application, the following:

- Declaration of Personal Data (form available from the Secretariat).
- Certified Photocopy of your Identity Card or Passport.
- Birth Certificate (only for male students who wish to defer military service).

4.2 Registration renewal - Course declaration

Postgraduate students are obliged to renew their registration within the deadline announced by the Secretariat of the MSc for each academic semester. The renewal is done electronically using special software (Electronic Secretariat), through the process of submitting the declaration of courses to be attended. The initial registration in the first semester is also completed by submitting the online course declaration. Failure to meet the registration deadline will result in the loss of the opportunity to attend the current semester. In this case, a decision of the Departmental Assembly is required for the continuation of the course, following a proposal of the Board of Directors.

At the time of renewal, the graduate student selects the courses he/she intends to attend. The total number of credits of the courses to be attended per academic semester cannot exceed thirty 30 ECTS.

A student may substitute or delete a course from the list of courses registered by the student within an exclusive period of three (3) weeks from the start of the course. In this case, the deleted courses are considered as never declared, are not taken into account in the further progress of the student and do not create any kind of obligation for the student. Under no circumstances, however, may a student, after any cancellations, not be enrolled in any course per semester of study.

A student who has not renewed his/her registration for two (2) consecutive semesters, is automatically deprived of his/her student status and is removed from the MSc.

4.3 Academic Advisor

For each postgraduate student, a faculty member is appointed by the Steering Committee as an Academic Advisor who is responsible for monitoring and controlling the general progress of the postgraduate student's studies.

The Academic Advisor supervises the study and research progress of the graduate student, in accordance with the provisions of the Academic Regulations. In particular, he/she monitors the progress of the student, advises him/her on academic, organisational or administrative matters and recommends issues concerning the student to the Board of Studies. The student must inform the Academic Advisor about the progress of his/her studies and in particular about the final configuration of the courses in which he/she is enrolled each semester.

4.4 Follow the course

The start and end dates of the courses of the MSc are determined within the framework of the annual Academic Calendar of the Foundation, which are announced in time by the Secretariat of the MSc. The Board, upon the recommendation of the Board, may modify the start and end dates of the courses in

order to make the programme more efficient. The January and June examination periods follow the Academic Calendar of the Institution. There is no September examination period.

The courses are taught according to the timetable announced by the Secretariat of the Department. Attendance may include lectures, seminars, special lectures, workshops, individual and/or collective work, oral and/or written examinations. The duration of each postgraduate course is 13 weeks.

The weekly teaching hours of each course are four (4). In addition to these hours and to cover the needs of workshops, seminars, practical exercises, etc., other hours may be added, following a reasoned decision of the Board of Directors after a recommendation of the Board.

Graduate students are obliged to attend all the lectures, workshops and any activities provided by the teacher for each course. Attendance of postgraduate courses is compulsory. Unexcused absences may not exceed 20% of the total teaching hours.

The organization of the educational process of the MSc can be carried out either face-to-face or by using modern distance learning methods using a platform approved by the university.

Problems that arise regarding the attendance of the courses are evaluated at the discretion of the lecturer and are dealt with on a case-by-case basis, initially by the lecturer and subsequently by the Director of the MSc and the MSc committee.

Unexcused absences cannot exceed 20% of the total teaching hours.

4.5 Examinations

The examination of students takes place at the end of each academic semester. The January and June examination periods follow the Academic Calendar of the Foundation. There is no September re-examination period.

If a student fails an elective course, he/she is entitled to either repeat it or replace it with another one from the MSc. If the student fails twice in the same course, he/she may request, by application to the President of the Department, within two weeks from the date of the announcement of the result, to be evaluated by a three-member committee consisting of teaching staff of the same or another Department of the UAS with a subject of the same or related to the subject of the course to be examined, in which the lecturer of the course may not participate. In case of non-submission of an application or rejection before the three-member committee, the student is removed from the MSc.

4.6 Calculation of degree grade

A postgraduate student is considered to hold the Diploma of Postgraduate Studies once he or she has fully completed the obligations as described in the regulations of the programme.

The final grade of the MSc is determined by the performance of the student in the courses and is calculated as the weighted average of the grades of the six (12) postgraduate courses, taking into account the weight of each course in credit units. Specifically:

$$FINAL\ GRADE = \frac{\sum (credit\ units \times grade)}{\sum credit\ units}$$

Where: ECTS = Course Credit Units

MTD = Diploma Credit Units

The grade of the degree of the is calculated with an accuracy of two (2) decimal places. The Diploma shall bear a designation which, in descending order of assessment, shall be as follows: FINE from eight

and fifty (8.50) to ten (10); VERY GOOD from six and fifty (6.50) to eight and forty-nine (8.49); GOOD from five (5) to six and forty-nine (6.49).

4.7 Suspension of studies

Postgraduate students may be granted, upon submission of an application to the School of Management, a temporary suspension of studies, which may not exceed a total of two (2) academic semesters, starting from the beginning of the academic semester for which the application is submitted. During the period of suspension, the postgraduate student shall lose his/her status as a student. The period of suspension shall not be counted towards the minimum and maximum periods of regular study.

Requests for suspension of a Graduate Student in the MSc programme are examined on a case-by-case basis after the completion of at least one (1) semester of study. Requests for suspension submitted after three (3) weeks from the start of classes will not be considered.

After the expiry of the suspension, the student continues his/her studies immediately without application and his/her name appears in the attendance records. Unjustified exceeding of the approved period of suspension will result in the immediate removal of the candidate from the MSc.

4.8 Tuition fees

For the attendance of the MSc programme there is a tuition fee of 3.600€ (300€ per course).

The payment of the tuition fee is made in one instalment each semester, within an exclusive period of three (3) weeks from the beginning of the course. Failure to pay the tuition fee on time will result in the student's exclusion from the examinations of the respective semester.

Postgraduate students who wish either to withdraw from the MSc, or to suspend their studies are entitled to a refund of the tuition fees paid during the current semester, provided that no more than three (3) weeks have elapsed since the start of classes.

4.9 Free attendance

According to article 86 of Law 4957/2022, registered students of a Postgraduate Studies Programme may attend it free of charge, if the payment of tuition fees is provided for, provided they meet the financial or social criteria set by law. A prerequisite for the granting of the right to free tuition on the basis of economic or social criteria is the fulfilment of the conditions for excellence in the first cycle of studies, corresponding at least to the possession of a grade equal to or higher than seven and a half with an excellent mark out of ten (7,5/10), provided that the evaluation of the basic degree presented for admission to the MSc programme has been awarded in accordance with the ten-point scale of a higher education institution (HEI) in the country, otherwise this criterion is applied proportionally in accordance with the respective evaluation scale, if the degree has been awarded by a foreign institution.

The total number of students attending free of charge may not exceed the number corresponding to thirty percent (30%) of the total number of enrolled students per academic year. If the calculation of the number of beneficiaries of the exemption from tuition fees results in a decimal number, it shall be rounded to the nearest whole number. If the number of beneficiaries of the exemption exceeds this percentage, the beneficiaries shall be selected in descending order until the number is reached.

The submission of applications for free study per MSc takes place after the completion of the admission process of students to the MSc and within a period of time determined by the Director of the MSc.

In addition to the provisions of free study, the MSc offers the possibility of scholarships to Graduate students based on their financial possibilities. The additional scholarships are granted exclusively on the basis of the academic performance of the graduate student during the course of studies. The Department may ask graduate student scholars to provide specific work within the framework of its needs of all kinds. The decision to award scholarships and the corresponding amount shall be determined by a decision of the Board of Trustees following a recommendation from the Board.

4.10 Duration

The minimum duration of study for the completion of the MSc "Applied Informatics" is four (4) semesters while the maximum cannot exceed six (6) academic semesters.

During the period of study in the MSc programme, students are required to attend postgraduate courses. Upon the justified recommendation of the Academic Advisor of a graduate student and his/her request, the Coordinating Committee (CC) of the MSc may recommend to the Departmental Assembly (D.A.A.) an extension of the student's period of study.

The MSc "Applied Informatics" may, in special cases, be offered as a part-time programme, in accordance with the provisions of article 6 par. 4 of the Rules of Procedure. Full-time and part-time students shall receive equivalent diplomas.

The duration of study in the part-time programme may not exceed twice the duration of the corresponding full-time programme.

4.11 Hardware Infrastructure

For the operation of the MSc programme, the existing logistical infrastructure of ECE Department is used. The teaching of the courses and the required research activity of the MSc is carried out in the Department's facilities, which adequately cover the needs of the programme in terms of the number of classrooms and laboratory and research spaces with the required logistical infrastructure for the uninterrupted operation of the programme.

At the T.H.M.M.Y. of the Faculty of Engineering of the University of Thessaly there are both general educational laboratories and specialized laboratories to support the educational and research needs of the department.

Specifically, for the operation of the Curriculum, the two existing general purpose laboratories are used, which have modern workstations that meet the training requirements. Gigabit Ethernet networking is available and wireless network access is available in the labs for students and faculty.

In addition to these laboratories, the Department has:

- specialized laboratory of Embedded Systems and CAD Tools
- specialized electronics laboratory.
- heterogeneous high-performance computing nodes.
- embedded and IoT systems development platforms.
- an adequate cloud computing infrastructure used both in education (in a significant number of courses and theses) and in research (electronics, big data, bioinformatics, telecommunications/networks, etc.) and providing opportunities for large-scale, demanding experiments, making use of virtual machine technology.
- a significant number of software, both open source and closed source, for application development and education.

The Department has, apart from the educational and research laboratories, research groups that maintain continuous collaborations with other university institutions and research institutes in Greece and abroad and are related to scientific fields of the broader scientific area and activity of Electrical and Computer Engineering.

4.12 Rights and financial support for postgraduate students

Graduate students have all the rights and benefits provided by the legislation for students of the 2^{ou} cycle of studies.

The University of Thessaly ensures that students with disabilities and/or special educational needs have accessibility to the proposed textbooks and teaching.

Graduate students can participate in research projects and be paid for it. They may be remunerated by projects for the provision of specialised scientific and technological services or other remuneration in accordance with the provisions in force. The Department encourages the participation of NPOs in funded research projects, as well as external funding from various institutions (IHU, etc.).

5 Quality assurance

5.1 Copyright and plagiarism.

The copyright of the Postgraduate Diploma Theses or patent rights or commercial exploitation rights of the theses are determined by relevant decisions of the Ethics Committee of the University of Thessaloniki.

Any kind of plagiarism in coursework, publications or writing of Postgraduate Diploma Theses, fabrication of research data and unscientific behaviour in general is prohibited. The Ethics Committee is responsible for informing the students of the MSc and for imposing penalties where necessary. Detailed guidelines on this matter will be issued by the University Ethics Committee.

No postgraduate thesis is submitted for support unless it has first been checked by the online plagiarism prevention service of the Central Library of the Foundation.

5.2 Programme evaluation/quality control

The basic obligation of all the stakeholders of the MSc is to ensure and continuously improve its educational quality. For this purpose, the MSc as a whole, as well as the individual courses will be systematically evaluated according to the proposed procedures and criteria established by the Internal Quality Assurance System of the University of Thessaly and at the same time contribute to its further improvement.

6 Lecturers in the MSc

The lecturers of the MSc are internal members since the establishment of the MSc. (D.E.P., E.D.P.) of the Department of Electrical and Computer Engineering of the University of Thessaly and external collaborators, all of them holders of a PhD degree.

7 Course programme

The Diploma of Postgraduate Studies (M.Sc.) with the title "Applied Computer Science" requires the successful completion of twelve (12) Postgraduate Courses, which correspond to a total of 120 credit hours, distributed over four (4) semesters. The total number of credits (ECTS) required for the degree is one hundred and twenty (120). The programme structure and course content of the MSc is in accordance with international standards.

By decision of the Board of Trustees, a member of the Department's faculty is appointed as the Scientific Officer for each course of the MSc. The Scientific Officer for each course of the MSc, in collaboration with the lecturers of the course, is responsible for the implementation of the academic calendar, the quality of notes and books, the participation of the graduate student, the organization of workshops, lectures and tutorials that fall within the subject in order to implement the course in the best possible way. In addition, in the event of non-implementation of part or all of a course, it shall ensure that it is made up for.

The courses of the MSc are divided into compulsory and elective (Compulsory [M] or Elective [E]). The structure of the programme and the titles of the postgraduate courses per semester with their credit units (ECTS) are presented in the following tables:

CURRICULUM

Semester 1

a/a	Course	Credits (ECTS)	Compulsory / Optional
1	Introduction to Computer Science (Introduction to Computer Science)	10	Y
2	Introduction to Application Programming (Introduction to Application Programming)	10	Y
3	Computer Organization (Computer Organization)	10	Y

Semester 2

a/a	Course	Credits (ECTS)	Compulsory / Optional
1	Object Oriented Programming (OOP)	10	Y
2	Database Systems (Database Systems)	10	Y
3	Data Structures and Algorithms (Data Structures and Algorithms)	10	Y

Semester 3

a/a	Course (Choice of three of the below)	Credits (ECTS)	Compulsory / Optional
1	Computer Networks (Computer Networks)	10	E
2	Software Design and Development (Software Design and Development)	10	E
3	WWW Application Development (WWW Application Development)	10	E
4	Security and Cryptography (Security and Cryptography)	10	E
5	Technologies in Education (Educational Technologies)	10	E

Semester 4

a/a	Course (Choice of three of the below)	Credits (ECTS)	Compulsory / Optional
1	Data Mining and Analysis (Data Mining and Analysis)	10	E
2	Mobile Application Development (Mobile Application Development)	10	E

3	Embedded Systems Applications (Embedded Systems Applications)	10	E
4	Machine Learning and Applications (Machine Learning Applications)	10	E
5	Wireless Networks (Wireless Networks)	10	E
6	Serious Games (Serious Games)	10	E

A subset of the electives in the curriculum may be offered each semester, depending on the preferences of the enrolled students and the resources of the programme. In any case, this subset must be sufficient to - as a minimum - exceed the course registration requirements of full-time students.

The language of instruction of the MSc is Greek or English.

A brief description of the content of the courses of the MSc is as follows:

Introduction to Computer Science: This course provides students with an introduction to the components of a computer system, data representation, basic mathematical tools and algorithms. Topics covered include: Components of a Computer, Arithmetic Systems and Operations, Data Storage, Computer Organization (Hardware, Operating System, Software), Induction and Recursion, Algorithms and Complexity, Enumeration Techniques, Graphs and Trees.

Introduction to Application Programming: This course includes introduction to programming, iteration structures, control structures, string management, functions, code checking and debugging, problem solving through exhaustive enumeration and approximate solutions, algorithm performance evaluation.

Computer organisation: The course includes introduction to Boolean algebra, basic combinatorial gates, truth tables, simplification with Karnaugh maps, simplification with the Quine-McCluskey method, sequential elements and circuits, diagrams and state tables, sequential circuit design, state minimization, RAM, algorithmic Finite State Machines, general description of the organization of a computer, introduction to symbolic machine language (assembly) with emphasis on the assembly of the MIPS processor, procedure support in the hardware of a PC, micro-architecture of MIPS processors, implementation of micro-architecture of a machine cycle, control and data section, micro-architecture of pipelines, problems caused by pipelining, such as structural errors, data and control errors (structural, data, control hazards), memory hierarchy and caches. System performance with memory hierarchy, virtual memory.

Object Oriented Programming: the course covers the following concepts: classes, constructors and constructors of replicators, method overloading, object creation, accessibility control of class members, inheritance, polymorphism, abstract classes and interfaces, exceptions, reading and writing to files, generalizations, use of the basic language libraries.

Database Systems: this course is the basic introductory course in the important field of database systems. Specifically, the syllabus includes the following topics: Introduction to Database Management Systems (DBMS), Architecture of a DBMS, Data modeling with the Entity-Correlations Model, Presentation of the Relational Model, Conversion of the Entity-Correlations Model to the Relational Model, Introduction to Relational Algebra, the SQL Language (definition and data management), Introduction to a Relational Database System, Relational Dependencies and Normalization, Design of a DB, Physical organization of a DBMS: Storage Media, File Organizations and Directories.

Data Structures and Algorithms: This course provides students with an introduction to basic data structures, the main classification and search algorithms, and techniques for designing and analyzing the properties of algorithms. Topics covered include: introduction to asymptotic estimation, worst-case, average, and shared-case performance. Basic Data Structures (Tables, Lists, Stacks, FIFO Queues, Biploirs), Static - Dynamic Trees and their traversals, Binary Search and Introduction and Analysis of Comparative Classification Algorithms (Insertion, Selection, Bubble, Sequencing, Merge). Dictionary Tree Structures: Simple and Balanced Trees (AVL), Introduction to Hashing and Unordered Dictionaries (Chained Hashing, Open Directional Hashing, Re-Hashing), Priority Queues. Algorithm Design Techniques (Brute force method, Divide and Conquer, Dynamic Programming, Greed, Pro and con space versus time). Graphs (Undirected and Directed). Intersections of Graphs and Their applications (Coherence, Shortest Paths, Overlapping Trees, Flows).

Computer networks: This course discusses basic concepts and technologies found in computer networks, such as Internet protocols: HTTP, TCP/IP, Ethernet, etc. A top-down approach is followed, following the philosophy of organizing networks in layers, starting from the application layer and going down to the link layer. Students will learn how network applications work and emphasis will be placed on Internet applications such as e-mail and the HTTP protocol as well as the basic communication protocols used on the Internet (TCP/IP). The course will include a lab in which students will gain hands-on experience in programming two-way applications as well as an understanding of the various protocols through network simulation software.

Software Design and Development: The main objective of this course is to provide the technical and managerial skills necessary for the design and development of software projects. In particular, it covers: introduction to software technology, software development process models, software development life cycle, software development process modelling, software project management, requirements extraction, system and subsystem design, object-oriented design and basic formal notational approaches (UML), usage models, interaction models, software design, software architecture, software architecture, software testing, software quality, system maintenance, modern development methodologies software (Agile).

Web Application Development: This course is an introduction to application development technologies for the World Wide Web (WWW). Topics covered include an analysis of basic concepts (e.g., Internet, WWW, Web 2.0), the HTTP protocol, client-server architecture on the Web, application architecture for the Web, principles of designing user-friendly interfaces on the Web, authoring and typesetting languages (HTML5, CSS), client programming languages (JavaScript), server-side programming (PHP), interfacing Web applications with database systems (PHP+MySQL), asynchronous client-server communication techniques (AJAX, JSON), security, information retrieval, introduction to Web services.

Security and Cryptography: This course introduces students to selected advanced topics in the field of Computer Security and Cryptography. Initially, basic security topics are analyzed and fundamental security concepts are studied. The categories of threats and vulnerabilities of information systems are studied, as well as the different categories of malware. Then, the security models that are applicable to various information systems, such as databases, mobile computing systems, wired and wireless networks, etc. are described. and studies various examples and specific security problems of these systems. Particular emphasis is given to the description of the science of cryptography. Cryptographic algorithms and their applications are described, e.g. digital signatures and digital certificates. In addition,

security-oriented network protocols are discussed, e.g., HTTPS, SSH, SSL, SET, SSO, IPSec, and security issues at the TCP/IP level. Finally, standards, policies and legal issues are discussed and models for evaluating system security are described.

Technologies in Education: the content is guided by a synoptic approach to the interdisciplinary convergence of learning theories, instructional design and technological tools. Study of the integrated integration of ICT in the learning process. Analysis and deepening of issues of theoretical pedagogy and teaching methodology as they emerge in all aspects of educational practice (in formal, non-formal and informal learning). Categorisation, study and practical application of the most popular educational environments and software tools. Analysis of educational scenarios. Evaluation and assessment of ICT tools that enhance the quality of the learning process. Development of computational thinking skills. The course material includes theoretical approaches, teaching models, learning environments, ICT integration practices in the educational ecosystem. The course includes both theoretical analysis and practical application. Modern computing environments are presented while methodically analysed and critically evaluated in terms of their effectiveness in shaping appropriate and personalised learning "pathways". Students, through the development of teaching scenarios and micro-scenarios, gain an understanding of the field, acquire knowledge and skills in handling and adapting digital environments in everyday educational practice and are encouraged to critically engage with ICT and reflect on their multifaceted application.

Data Mining and Data Analysis: the course aims at understanding the principles of the techniques, theories and algorithms of Data Mining and Data Analysis. The aim of the course is to introduce the techniques that can be adopted for data analysis, covering the whole range of data processing. The basic concepts of knowledge mining will be presented and discussed and various algorithms that have been proposed in this scientific area will be studied. The approach taken in teaching the course will be tailored to the needs of novice users, but at the same time advanced techniques will be presented in order to cover the subject of data analysis in depth. The field of Data Mining and Analysis is very important. The course presents and studies the following: introduction to data mining and analysis, data and properties, data pre-processing, data repositories, data cube and information retrieval, frequent patterns and data associations, categorization, clustering, anomaly detection, advanced techniques, data and high-volume data streams.

Mobile Application Development: This course focuses on mobile application development. Applications that run on a mobile phone are called "mobile". The user expects mobile applications to behave similarly to the behavior of applications on their desktop computer. The main operating systems of mobile devices are Android (~80%) and iOS (~20%) and these percentages tend to consolidate in recent years. We first study the programming of hybrid mobile applications in HTML5 and Javascript to run on all mobile device operating systems. Then the course deals with programming mobile applications in Java for the Android operating system with AndroidStudio. Within the course, students learn to program relatively simple mobile applications up to more complex ones, but also gain a solid foundation for professional work in this field in the future. Specifically, the topics studied are: introduction to mobile applications - android operating system, Javascript overview (variables, functions, program structure) - DOM - HTML5 overview (structure, semantic tags, multimedia, events), HTML5 introspection (storage, messages, network, workers) - Javascript introspection (objects), Ajax - WebSockets, JS promises, sensors, Hybrid Apps, HTML5 Frameworks, introduction to Android programming - types of apps, Android Apps, resources, graphics, Intents, Fragments, data storage, threads, permissions, network, sensors, using Android ContentProviders, Android Services, camera, maps, publishing apps, Android

Content Provider implementation, Broadcast Receiver Apps, microphone, Bluetooth, WiFi, Styles/Themes, WebView, user location tracking, locality services

Applications with Embedded Systems: The course includes introduction to embedded systems, performance, energy consumption, cost, cost, functionality, security, etc. issues in embedded systems, software design methodology in embedded systems, logic and hardware/architecture interaction in modern embedded systems, embedded processors (ARM processor example), ARM processor based systems-on-chip architecture, improving the performance of an application through software, improving the performance of an application through hardware, hardware accelerators, hardware accelerators, hardware accelerators, software accelerators, hardware accelerators, hardware accelerators.

Machine Learning and Applications: This course aims to introduce students to the science of Machine Learning and its applications. To equip them with the necessary theoretical and practical knowledge to be able to recognize the nature of any problem, choose the appropriate solution method and verify the quality of the results. The course analyses fundamental machine learning algorithms and techniques covering a wide range of applications. In summary, topics presented are: supervised learning (linear and nonlinear regression, support vector machines, neural networks, decision trees), unsupervised learning (clustering, recommender systems), machine learning applications, bias/variance evaluation.

Wireless Networks: This course deals with topics in the area of wireless telecommunication networks. The following topics will be covered. Introduction to wireless networks, overview of previous systems, existing 2nd, 3rd, 4th and 5th Generation systems, Unstructured networks, IEEE Standards and more specifically 802.11. Fundamental principles of propagation in wireless environments: Propagation in free space, Intermittency, multiple paths. Wireless link communication and handling of mobile users changing their point of connection to the network, techniques to ensure continuous connectivity and quality of service to users and applications of wireless/mobile networks. Interference, Power Control in wireless networks. The characteristics of wireless links, multiple access with the CDMA system, wireless local area networks (IEEE 802.11), cellular Internet access, user mobility management principles, mobile routing and mobile IP, and unstructured mobile networks will be considered. The course also includes labs in which students will gain a more hands-on experience with wireless network technologies using simulation software as well as accessing a real experimental wireless network.

Serious Games: This course aims to develop knowledge and skills in understanding, analyzing, designing, developing, and evaluating learning games, i.e., games designed with learning in mind. Specifically, students understand concepts and methods of designing and implementing learning games; pedagogical methods underlying learning games, such as active learning, problem-based learning, cooperative learning, and experiential learning; methods and processes related to conceptualizing a learning game, designing, and implementing a learning game; issues of linking a game to learning objectives; evaluating the learning benefits of a game in relation to learning objectives; and research th

8 Validity and amendments

The MSc Committee may recommend to the Board of Trustees the modification of the articles of this Guide to Studies, following the relevant suggestions of those involved in the programme, taking into account the Internal Regulations of the MSc and the Regulations of Studies of the MSc.