MSc in Systems and Services Engineering for the Information Society (MSSEIS)

MÁSTER UNIVERSITARIO EN INGENIERÍA DE SISTEMAS Y SERVICIOS PARA LA SOCIEDAD DE LA INFORMACIÓN (MISSSI)

Introduction

This document summarizes the contents of the MSSEIS' study plan. Depending on your itinerary or your double degree program, you may have to fulfil different courses to complete your studies. Firstly, note what are your requisites, and then you can check the brief description of the contents of each course to help you decide. Please note that each academic course the contents of some subjects may suffer slight changes.

Itineraries, intensifications, double degrees

Itinerary: Conventional MSSEIS

In this case, you have to fulfil 30 ECTS during each of the two semesters (Fall and Spring).

During the Fall semester, you will obtain 25 ECTS through mandatory subjects and 5 ECTS by choosing one 5-ECTS subject out of three, as shown in this chart:

CODE CÓDIGO	SUBJECTS ASIGNATURAS	ETCS	TYPE TIPO	PERIOD PERIODO	DEPT. DPTO.
593000400	WIRELESS COMMUNICATIONS COMUNICACIONES INALÁMBRICAS	5	Mandatory (Obl.)	1	D250
593000401	ADVANCED DIGITAL ARCHITECTURES ARQUITECTURAS DIGITALES AVANZADAS	5	Mandatory (Obl.)	1	D230
593000402	AUDIO AND VIDEO SIGNAL PROCESSING PROCESADO DE SEÑALES DE AUDIO Y VÍDEO	5	Mandatory (Obl.)	1	D250
593000403	UBIQUITOUS AND SECURE NETWORKS AND SERVICES REDES Y SERVICIOS UBICUOS Y SEGUROS	5	Mandatory (Obl.)	1	D230
593000404	ICT MANAGEMENT IN THE ORGANIZATIONS GESTIÓN DE LAS TIC EN LAS ORGANIZACIONES	2	Mandatory (Obl.)	1	D400
593000405	ICT AND THE INFORMATION SOCIETY TIC Y SOCIEDAD DE LA INFORMACIÓN	3	Mandatory (Obl.)	1	D250
593000406	DATA MODELLING AND ANALYSIS IN ENGINEERING MODELADO Y ANÁLISIS DE DATOS EN INGENIERÍA	5	Choose 5 ECTS Optativas, elegir 5 ECTS	1	D510
593000407	ADVANCED RESEARCH SEMINARS I SEMINARIOS AVANZADOS DE INVESTIGACIÓN I	5		1	D250
593000408	INDUSTRY INTERNSHIP I PRÁCTICAS EN EMPRESAS I	5		1	--

For Spring semester, you have to choose among two possible intensifications, with the following requirements:

- Systems intensification: 10 ECTS from block "systems" + 5 ECTS from block {"systems" or "services" or "transversal"} + 15 ECTS (Master Thesis).
- Services intensification: 10 ECTS from block "services" + 5 ECTS from block {"systems" or "services" or "transversal"} + 15 ECTS (Master Thesis).

The subjects of each block for Spring semester are as follows:

CODE CÓDIGO	SUBJECTS ASIGNATURAS	ETCS	TYPE TIPO	PERIOD PERIODO	DEPT. DPTO.
593000412	RF ELECTRONIC DESIGN DISEÑO ELECTRÓNICO PARA SISTEMAS DE RF	5	Block: systems Bloque de sistemas	2	D250
593000409	SIGNAL PROCESSING TECHNIQUES FOR COMMUNICATIONS TÉCNICAS AVANZADAS DE PROCESADO DE SEÑAL	5		2	D250
593000410	ADVANCED VIRTUAL INSTRUMENTATION SYSTEMS SISTEMAS AVANZADOS DE INSTRUMENTACIÓN VIRTUAL	5		2	D230
593000411	EMBEDDED SYSTEMS SISTEMAS EMPOTRADOS	5		2	D230
593000413	ADVANCED AUDIOVISUAL CODING CODIFICACIÓN AUDIOVISUAL AVANZADA	5	Block: services Bloque de servicios	2	D250
593000417	SIGNAL RECOGNITION TECHNIQUES TÉCNICAS DE RECONOCIMIENTO DE SEÑAL	5		2	D250
593000416	TELEMATIC SERVICES FOR THE INFORMATION SOCIETY SERVICIOS TELEMÁTICOS PARA LA SOCIEDAD DE LA INFORMACIÓN	5		2	D230
593000414	SERVICES AND PROTOCOLS ENGINEERING INGENIERÍA DE SERVICIOS Y PROTOCOLOS	5		2	D230
593000415	ADVANCED RESEARCH SEMINARS II SEMINARIOS AVANZADOS DE INVESTIGACIÓN II	5	Block: Transversal Bloque transversal	2	D250
593000418	INDUSTRY INTERNSHIP II PRÁCTICAS EN EMPRESAS II	5		2	--
593000419	MASTER THESIS TRABAJO FIN DE MÁSTER	15	Mandatory (Obl.)	1 & 2	All Todos

Department codes:
D230: Ingeniería Telemática y Electrónica
D240: Lingüística Aplicada a la Ciencia y a la Tecnología
D250: Teoría de la Señal y Comunicaciones (provisional)
D400: Ingeniería de Organización, Administración de Empresas y Estadística
D510: Electrónica Física, Ingeniería Eléctrica y Física Aplicada
D540: Matemática Aplicada a las Tecnologías de la Información y las Comunicaciones

Itinerary: EIT Digital MS ITA programme, second year specialization on "Technologies for Internet Mobile and Ubiquitous Computing"

In this itinerary there are seven subjects, five taught during the Fall semester and the other two during the Spring semester, and you have to choose any five out of these seven subjects.

Your Fall + Spring academic offer is summarized as follows:

CODE CÓDIGO	SUBJECTS ASIGNATURAS	ETCS	TYPE TIPO	PERIOD PERIODO	DEPT. DPTO.
593000420	I&E THESIS TESIS DE INNOVACIÓN Y EMPRENDIMIENTO	6	Mandatory (Obl.)	1	--
593000421	WIRELESS COMMUNICATIONS COMUNICACIONES INALÁMBRICAS	5	Choose 25 ECTS Optativas, elegir 25 ECTS	1	D250
593000422	ADVANCED DIGITAL ARCHITECTURES ARQUITECTURAS DIGITALES AVANZADAS	5		1	D230
593000423	AUDIO AND VIDEO SIGNAL PROCESSING PROCESADO DE SEÑALES DE AUDIO Y VÍDEO	5		1	D250
593000424	UBIQUITOUS AND SECURE NETWORKS AND SERVICES REDES Y SERVICIOS UBICUOS Y SEGUROS	5		1	D230
593000425	ADVANCED RESEARCH SEMINARS I SEMINARIOS AVANZADOS DE INVESTIGACIÓN I	5		1	D250
593000426	SIGNAL PROCESSING TECHNIQUES FOR COMMUNICATIONS TÉCNICAS AVANZADAS DE PROCESADO DE SEÑAL	5		2	D250
593000427	EMBEDDED SYSTEMS SISTEMAS EMPOTRADOS	5		2	D230
593000428	MASTER THESIS WORK SUPPLEMENT SUPLEMENTO AL TRABAJO FIN DE MÁSTER	15	Mandatory (Obl.)	1 & 2	All Todos
593000429	MASTER THESIS TRABAJO FIN DE MÁSTER	15	Mandatory (Obl.)	1 & 2	All Todos

Besides the regular subjects, you have to fulfil a total of 30 ECTS, mainly in Spring, through these two mandatory blocks:

- MASTER THESIS WORK SUPPLEMENT.
- MASTER THESIS.

These two subjects form your "Final Degree Project" (read the document "EIT Digital Master School Choosing your Final Degree Project v1-students July 2017.pdf" for further information), which should combine both scientific as well as industrial content. Your Master Thesis Work Supplement may be fulfilled in the form of an industrial internship through an instrument that is called "curricular industrial internships" ("*prácticas externas curriculares*") in our University.

Itinerary: Double Master's Degree Cooperation Agreement between Tongji University and UPM, year 2 for Tongji students

If you are a Tongji student doing your second year of this Double Master's Degree program, you have to complete a total of 15 ECTS during the Fall semester and 20 ECTS during the Spring semester, structured in the following manner.

Fall semester:

- Choose 5 ECTS from the following:
    - ICT MANAGEMENT IN THE ORGANIZATIONS (2 ECTS)
    - ICT AND THE INFORMATION SOCIETY (3 ECTS)
    - DATA MODELLING AND ANALYSIS IN ENGINEERING (5 ECTS)
- Choose 10 ECTS from the following:
    - WIRELESS COMMUNICATIONS (5 ECTS)
    - ADVANCED DIGITAL ARCHITECTURES (5 ECTS)
    - AUDIO AND VIDEO SIGNAL PROCESSING (5 ECTS)
    - UBIQUITOUS AND SECURE NETWORKS AND SERVICES (5 ECTS)
    - ADVANCED RESEARCH SEMINARS I (5 ECTS)

Spring semester:

- Mandatory activity (5 ECTS): Paper writing and publication (5 ECTS).
- Elective courses (15 ECTS): You have to choose three out of the following nine courses (5 ECTS each):
    - RF ELECTRONIC DESIGN
    - SIGNAL PROCESSING TECHNIQUES FOR COMMUNICATIONS
    - ADVANCED VIRTUAL INSTRUMENTATION SYSTEMS
    - EMBEDDED SYSTEMS
    - ADVANCED AUDIOVISUAL CODING
    - SIGNAL RECOGNITION TECHNIQUES
    - TELEMATIC SERVICES FOR THE INFORMATION SOCIETY
    - SERVICES AND PROTOCOLS ENGINEERING
    - ADVANCED RESEARCH SEMINARS II

(see http://www.etsist.upm.es/uploaded/832/tongji_DT_MISSSI.pdf for further details).

Summary of the Fall semester courses

WIRELESS COMMUNICATIONS

The course gives the student the basic knowledge and skills to understand, characterize and analyze wireless communication systems. Some radiating systems typically employed in wireless communications are presented, analyzed and measured in the laboratory. There is a detail description of the propagation mechanisms affecting the radio channel, especially multipath fading, as well as radio access technologies currently used in wireless systems: multicarrier transmission, multi-antenna techniques and different radio-related procedures. The physical layer of two wireless communications standards, IEEE 802.11 for wireless LAN and Long Term Evolution for mobile communications, are studied in depth.

Syllabus:

1. Introduction to wireless communication systems
    1.1. The wireless spectrum
    1.2. Structure of a wireless communication system
    1.3. Digital modulations
    1.4. The cellular concept
    1.5. Wireless communication standards
2. Radiating systems and propagation in wireless communications
    2.1. Fundamentals of antennas
    2.2. Linear, printed and active antennas
    2.3. Antennas for wireless and mobile systems
    2.4. Fundamentals of radiowave propagation applied to wireless communications
3. Radio access technologies
    3.1. The wireless channel environment
    3.2. Multipath fading
    3.3. Multicarrier transmission
    3.4. Multi-antenna techniques
    3.5. Radio-related procedures
4. Wireless Local Area Networks. IEEE 802.11
    4.1. Network architecture
    4.2. IEEE 802.11 family of standards
5. Long Term Evolution (LTE)
    5.1. General overview of 4G communications
    5.2. LTE channel models
    5.3. Physical layer
    5.4. Scheduling, link adaptation, multi-antenna techniques

ADVANCED DIGITAL ARCHITECTURES

The main objective of this subject is to present the fundamental technologies used in embedded electronic systems.

After introducing the basic concepts of advanced digital architectures (processors, DSPs and FPGAs), the subject focuses in the usage of General Purpose Processors (GPP) and how to run an operating system on them such as the embedded version of Linux. This includes the description of ARM processors, the usage of a platform such as BeagleBone which is based in a system that includes a processor of that type, and the usage of Buildroot to generate a Linux distribution.

Syllabus:

1. Introduction to embedded systems. Technologies used to design these systems. Architectures of General Purpose Processors (GPP).
1.1. Advanced digital architectures.
    1.1.1. GPP.
    1.1.2. Digital signal processors.
    1.1.3. Architectures using FPGAs and SoC.
1.2. Introduction to embedded systems.
1.3. Introduction to the ARM processor family.
    1.3.1. Basic architecture of an ARM processor.
    1.3.2. Reduced instruction set.
    1.3.3. Pipeline.
    1.3.4. Memory levels.
1.4. Embedded operating systems. Embedded Linux.
    1.4.1. Basic characteristics.
    1.4.2. Basic elements of the OS.
    1.4.3. Buildroot
1.5. Description of the BeagleBone platform and tools.
    1.5.1. Beaglebone Black
    1.5.2. Virtual machine with Linux Desktop: Ubuntu
    1.5.3. Eclipse.
1.6. Guided tutorial on the design cycle with BeagleBone using Buildroot.
1.7. Development of applications using BeagleBone

AUDIO AND VIDEO SIGNAL PROCESSING

The subject deals with advanced digital signal processing techniques applied to audio and video.

Syllabus:

1. Adaptive filtering.
2. Spectral estimation.
3. Filter banks for audio signal.
4. Transforms.
5. Image enhancement and restoration. Point operations.
6. Pattern classification.

UBIQUITOUS AND SECURE NETWORKS AND SERVICES

This subject is taught during the first semester of the "MSc in Systems and Services Engineering for the Information Society" (Máster en Ingeniería de Sistemas y Servicios para la Sociedad de la Información). In order to be able to follow it, it is strongly advisable to have a previous background on the main telematic concepts related to communication networks, protocols and services, since these basic concepts will not be part of its contents. Its 5 ECTS correspond to a total of around 133 hours of student's work, including both theory- and practical- (i.e. laboratory-) oriented activities. This includes all the activities to be done autonomously, either individually or in groups.

Syllabus:

1. Unit 1: Introduction to ubiquitous systems
   1.1. Ubiquitous / pervasive computing
   1.2. Network aspects and deployment in ubiquitous systems
   1.3. Future Internet: Internet of Things, Internet of Services, Internet of People
2. Unit 2: Applications and services
   2.1. Types of ubiquitous applications and services. Examples of use scenarios
   2.2. Context awareness, human-machine interfaces
   2.3. Quality of service and application requirements
   2.4. Main technological challenges
3. Unit 3: Types of ubiquitous systems: Architectures and platforms
   3.1. Wireless Sensor Networks (WSN)
   3.2. Ad-hoc networks
   3.3. Personal- and body-area networks
   3.4. Other networks
4. Unit 4: Network technologies
   4.1. Network-related technological challenges; energy efficiency
   4.2. Link-layer protocols
   4.3. Network-layer protocols; routing
   4.4. Quality of Service (QoS)
   4.5. Communication models
5. Unit 5: Ubiquitous systems security
   5.1. Vulnerabilities of ubiquitous networks and services
   5.2. Cryptographic mechanisms as the basis of the security
   5.3. Intrusion detection
   5.4. Security management
6. Unit 6: Practical project
   6.1. Design, implementation and deployment of an ubiquitous application / service

ICT MANAGEMENT IN THE ORGANIZATIONS

This subject seeks to enable students to know and understand the performance of the investment in information technology and what problems may arise. It also studies the relationship between technology and strategy processes and other issues of organization and / or governance of the company. In organizations dedicated to the generation of products or services in high technology sectors where the validity period of a particular technology (in terms of adequacy and comparative performance with other competitors) is increasingly reduced (shorter product cycles) Knowing these concepts becomes essential. Thus, in the first three themes, we introduce some conceptual bases with the purpose of reviewing and framing some concepts necessary for the treatment of the following topic. We study the evolution and approaches of information systems strategy, including the search for sustainable competitive advantage in strategic innovations in information systems. A review of the evolution of the information systems strategy over the years is presented. Flexible infrastructures are presented that are adaptable to today's changing, dynamic and competitive environments. The fourth theme reviews the main current challenges and innovations in the ICT Management of Organizations. The contents of this topic evolve and are updated as new challenges appear or others are overcome.

Syllabus:

1. 1: Foundations
    1.1. 1.1.-Conceptual Strategy developments in Information Systems
    1.2. 1.2.-IT Initiatives and Sustaining Competitive Advantage
    1.3. 1.3.- Information Systems Management and Strategy Formulation
    1.4. 1.4.-Approaches to Information Systems Planning
    1.5. 1.5.-The Information Systems Planning Process
2. 2: Components of Information Systems Strategy
    2.1. 2.1.-A Comprehensive Model of Information Strategy
    2.2. 2.2.-Information Technology Strategy
    2.3. 2.3.-Principles and Models for Organizing the IT Function
    2.4. 2.4.-Evaluating the Outcomes of Information Systems Plans
3. 3: IT Management : Perspectives and Considerations
    3.1. 3.1.- The CIO Role
    3.2. 3.2.- IT Strategy and Organizational Culture
    3.3. 3.3.- IT Governance
    3.4. 3.4.- Strategies for Managing in Difficult Environments
    3.5. 3.5.- IT Project Evaluation
    3.6. 3.6.- Resource-Based View and Competitive Strategy
4. 4: Challenges strategies managing Media and in Social
    4.1. 4.1.- Business Impact of Web 2.0 technologies
    4.2. 4.2.- Strategic Development of Business Models: Implications of the Web 2.0 for Creating Value on the Internet
    4.3. 4.3.- Marketing meets Web 2.0, Social Media, and Creative Consumers: Implications for International Marketing Strategy
    4.4. 4.4.-Collaborative Economy and Value Creation
    4.5. 4.5.- Co-creation experiences: the next practice in Value Creation
    4.6. 4.6.-Business Models for Smart Grid
    4.7. 4.7.-The new customer relationship challenge: Social CRM.
    4.8. 4.8.- If you love something, let it go mobile: Mobile marketing and mobile social media 4x4
    4.9. 4.9.- New perspectives for research in Internet: Web 2.0 and Enterprise 2.0

ICT AND THE INFORMATION SOCIETY

This course is intended for graduate students in engineering who are interested in knowing the most remarkable characteristics of the Information Society and, in addition, who wish to get acquainted with Information and Communication Technologies (ICTs) and how they are changing our present society. Along this course, next topics will be presented and studied:

- Historical evolution of ICTs.
- Different faces from which the Information Society can be studied.
- The meaning of the Information Society and its implications for modern societies.
- Economic, social and political changes happened in modern societies from the introduction of ICTs.
- Recognizable paradigms of the Information Society.
- Risks of the Information Society and antidotes to solve them.
- Conflicts involved in the Information Society and trade-offs related.
- Enabling Technologies for the Information Society.

Syllabus:

1. Unit 1
   1.1. Towards getting to know the Information Society
   1.2. Information Society ? What is it exactly?
   1.3. Technology and Society in the Information Age
2. Unit 2
   2.1. Social Networks and the Network Society
   2.2. Use of Space in the Information Society Age
   2.3. Innovation and Competitiveness in the IS
3. Unit 3
   3.1. Introduction to the legal regulation of IS
   3.2. The Information Strategy of the European Union
   3.3. e-Government in the European Union
   3.4. e-Inclusion in the Information Society
4. Unit 4
   4.1. Case of Study
   4.2. Facts and Figures about the Information Society
   4.3. Practical Exercise: ICT Development Index

DATA MODELLING AND ANALYSIS IN ENGINEERING

"Modeling and Analysis of Data in Engineering" aims to provide students with the necessary tools to correctly analyze measurement systems and results and subsequently elaborate technical reports or scientific papers. In addition, the studients will acquire skills on using prediction and simulation methods and then, propose improvements to devices and systems.

Syllabus:

1. Mathematical modelling in engineering problems.
   1.1. Mathematical representation of engineering problems.
   1.2. Error theory.
   1.3. Concepts of numerical algebra: Regression.
   1.4. Integration, differentiation and interpolation of data. Tools.
2. Application to experimental techniques of data analysis.
   2.1. Algebraic and graphic representation of data: linear regression, data fitting; analysis of simulated results.
   2.2. Data analysis and fitting of statistical distributions. Application to experimental results of tests.
   2.3. Global analysis of reliability test. Determination of parameters from test data.
3. Finite Elements Method
   3.1. Background of the Finite Elements Method.
   3.2. Fundaments of the Finite Elements Method.
   3.3. Applications of the Finite Elements Method.

ADVANCED RESEARCH SEMINARS I

The subject "Advanced Research Seminars I" aims at teach the student the state of the art in certain specific aspects of the specialization of the studies that he is undertaking as well as obtaining transversal competences related to professional practice and scientific activity.

Consequently, the organization of the subject is specific and in accordance with its objectives.

It is organized in a number of specific thematic seminars, aimed at intensifying the training of the student, and more specifically to improve the competences and learning outcomes specific to the Master.

Each seminar has a teaching load of between 1 and 2 ECTS, and are taught by researchers specialized professor and researchers in disciplines related to the objectives of the Master program.

In addition, most of the participating researchers are professors come from foreign institutions, in order to be able to offer the student the point of view and activity of other centres and research groups, thus enriching the student's education.

The seminars take place in workshops agreed with the investigators based on their availability, so a full closed schedule and planning can't be given.

The teaching schedule is compatible with that of the other subjects.

Summary of the Spring semester courses

RF ELECTRONIC DESIGN

This subject prepares the student to design advanced high frequency and microwave circuits and systems. Special attention is paid to high frequency signal generation circuits such as direct digital synthesizers and PLL advanced synthesizers, as well as state-of-the-art small signal and power amplification techniques.

SIGNAL PROCESSING TECHNIQUES FOR COMMUNICATIONS

Modern communication systems require the use of advanced signal processing techniques for the implementation of functions such as modulation / demodulation, channel compensation, suppression of interferences, etc.

In order to perform these functions, advanced signal processing techniques combined with radio software systems are used to implement these techniques easily.

The subject is focused on the study of the most advanced techniques of signal processing and its application to modern software radio systems. It is based mainly on the use of the MATLAB / SIMULINK program and radio software systems of National Instruments.

Syllabus:

1. INTRODCUTION
2. APLICATION OF MULTIRATE SYSTEMS
3. MIMO SYSTEMS
4. SOFTWARE DESING RADIO
5. ARRAY PROCESSING
6. LABORATORY

ADVANCED VIRTUAL INSTRUMENTATION SYSTEMS

This course introduces the student in the handling of Virtual Instrumentation technologies gradually starting from scratch. The first block deals with the development of simple data acquisition applications with a graphic programming tool widely used in the sector. In a second block, the use of more advanced techniques or technologies is explored, such as the control of low-level acquisition, real-time systems, and the programming of FPGAs from high-level graphic languages.

Syllabus:

1. Introduction
    1.1. Subject introduction
        1.1.1. Presentation of the syllabus, resources and regulations of the subject
    1.2. Introduction to virtual instrumentation
        1.2.1. Definition
        1.2.2. Used Technologies
        1.2.3. Development tools
        1.2.4. Systems descriptions
2. LabVIEW Programming
    2.1. Development environment
    2.2. Virtual instruments
    2.3. Modular programming
        2.3.1. Programming structures
        2.3.2. Arrays
        2.3.3. Clusters
        2.3.4. Viewing data: Graphs
        2.3.5. Conditional structures
        2.3.6. Files & Strings
        2.3.7. Property nodes
        2.3.8. Data management techniques
3. Applications Design
    3.1. Quality criteria in the development of software applications
    3.2. Software architectures
        3.2.1. Simple architecture, general, sequence and parallel loops
        3.2.2. States Machine
        3.2.3. Master / Slave
        3.2.4. Producer / Consumer
        3.2.5. Events Producer / Consumer
4. Introduction to Data Acquisition
    4.1. Introduction to the measurement chain and its specifications
    4.2. Structure and functionality of data acquisition systems
    4.3. Hardware configuration and testing
    4.4. Basic programming DAQ using LabVIEW
    4.5. Introduction to NIDaqmx
5. Advanced Data Acquisition
    5.1. Analog and digital triggers
    5.2. Counters
    5.3. Task synchronization
    5.4. Introduction to signal conditioning
6. Real Time Systems: LabVIEW RT
    6.1. Architecture of a Real Time System in Virtual Instrumentation
    6.2. Available technologies
    6.3. Configuration and Design Cycle
    6.4. Timing and acquisition data
    6.5. Communication
7. FPGAs in Virtual Instrumentation

7.1. Introduction
7.2. Available technologies
7.3. Design Cycle
7.4. Timing and acquisition data
7.5. Communication

EMBEDDED SYSTEMS

This course is a continuation of the Advanced Digital Architecture (ADA) course. While two of the technologies to implement an embedded system are taught in ADA, the third one, FPGA is covered here. The course begins with the basics of Programmable Logic Devices (PLD) as a target technology. Then, the VHDL language is applied to model two types of hierarchical digital subsystems: combinational and sequential. At last, in this block, VHDL test-bench specifications and stimuli are explained, applied and implemented. A complex VHDL test-bench specification is proposed as use-case to exercise the previous concepts.

Next block begins covering the architecture of current configurable embedded processors and the hardware design flow to synthesize the architecture of an embedded system. Afterwards, the software structure of an OS driver aimed to managed a custom-made peripheral is presented. At last, as a use-case, the student implements an embedded system consisting of a configurable embedded processor with a custom-made peripheral and its corresponding software.

Syllabus:

1. Programmable Logic Devices
2. VHDL Language
3. Parallelism & Pipelining
4. Functional Verification and Test-Bench Design
5. Intermediate Project: Complex Peripheral Verification
6. Configurable Embedded Systems
7. Software Design Flow for Embedded Systems
8. Course Project

ADVANCED AUDIOVISUAL CODING

This course is divided in 3 chapters:

Chapter 1: The student have to develop a software for video coding using the advanced VC-3 video coding standard for High Definition Studio images.

Chapter 2: The student have to make a review of the psichoacoustic coding utilized in advanced audio coding.

Chapter 3: Some electronic architectures utilized in video coding are reviewed.

Syllabus:

1. Advanced Video Coding
   1.1. Fundamentals of advanced video coding
   1.2. HDTV Intra Coding: VC3
2. Advanced Audio Coding
   2.1. Review of psichoacoustic based audio coding
   2.2. AAC Coding
3. Implementation Techniques

3.1. Mulitprocessor Architectures
3.2. Multimedia Processors

SIGNAL RECOGNITION TECHNIQUES

This subject presents and studies a general recognition system. Students should develop a complete system, they can choose the application of the system.

Syllabus:

1. General description of a recognition system
2. Project definition
3. Acquisition and pre-processing of audio-visual signals
4. Segmentation of audiovisual signals
5. Feature extraction
6. Classification and recognition
7. Music recognition
8. Artificial vision

TELEMATIC SERVICES FOR THE INFORMATION SOCIETY

Telecommunication networks and telematics applications are a key element in the development of the current Information Society since they are present in the vast majority of activities associated with our professional, social and recreational life. This subject addresses the knowledge of the services and fundamental scenarios of the Information Society, from a person-centered approach, in different areas: commerce, government and citizen participation, health, education, etc. A detailed analysis of the most significant experiences and technologies involved allows the design of value-added technological solutions for citizens and target organizations, especially if the human factors, socio-economic factors, legislation and existing standards are involved.

This subject has a total of 5 ECTS, which translates into 133 hours of student work, distributed regularly over 16 weeks. The subject follows a project-based methodology that implies an active assistance to face-to-face classes, self-study, bibliographic searches and the realization and presentation of two small projects detailing, each one, a specific service.

The proposed syllabus is only indicative of the contents that could be covered in the projects performed by the students. The specific service to be developed in the project will be decided, together with the teachers, in specific meetings held during the class.

Syllabus:

1. Introduction to the Information society and services
   1.1. Information society, services and telematics applications
   1.2. Paradigms of interaction with digital information
   1.3. Different ICT architectures for providing services
2. Analysis of requirements in the services and scenarios of the information society
   2.1. Human factors and user experience
   2.2. Emerging Technologies in the IS
3. E-commerce services
   3.1. Authentication and non-repudiation in business transactions
   3.2. E-commerce security infrastructures
4. E-Government Services

    4.1. Electronic administration
    4.2. Citizen participation
5. E-Health, telemedicine and digital inclusion systems
    5.1. Analysis of e-health services, telemedicine and application scenarios
    5.2. Design of accessible systems for e-health and telemedicine

SERVICES AND PROTOCOLS ENGINEERING

This subject is taught during the second semester of the "MSc in Systems and Services Engineering for the Information Society" (Máster en Ingeniería de Sistemas y Servicios para la Sociedad de la Información). Its 5 ECTS correspond to a total of around 133 hours of student's work, including all activities. Any of the following graduates (or students with demonstrable equivalent knowledge) may access this course the Graduate in Communication Electronics Engineering (Graduado en Ingeniería de Electrónica de Comunicaciones), Graduate in Telecommunication Systems Engineering (Graduado en Ingeniería de Sistemas de Telecomunicación), Graduate in Sound and Image Engineering (Graduado en Ingeniería de Sonido e Imagen), Graduate in Telematic Engineering (Graduado en Ingeniería Telemática).

Syllabus:

1. UNIT 0: Introduction to ISP
    1.1. Introduction to the course
    1.2. Supervision session for introducing the group research work topics and methodology
2. UNIT 1: Next generation of telematics services
    2.1. Trends to next generation services and systems
    2.2. Next generation services a case study
    2.3. Open issues and challenges
3. UNIT 2: Advanced networking
    3.1. Networking traditional protocols
    3.2. New trends in networking
    3.3. Networking current technical challenges
4. UNIT 3: Network security protocols and services
    4.1. Network security services
    4.2. Network security traditional protocols
    4.3. Security protocols for advanced networ
    4.4. Security and privacy technical challenges
5. UNIT 4: Open research issues in services and protocols engineering
    5.1. Study of state of the art on Advanced Engineering Techniques on Systems and Telematics Services Development
    5.2. Definition of technical reports
    5.3. Definition of research papers

ADVANCED RESEARCH SEMINARS II

The subject "Advanced Research Seminars II" aims at teach the student the state of the art in certain specific aspects of the specialization of the studies that he is undertaking as well as obtaining transversal competences related to professional practice and scientific activity.

Consequently, the organization of the subject is specific and in accordance with its objectives.

It is organized in a number of specific thematic seminars, aimed at intensifying the training of the student, and more specifically to improve the competences and learning outcomes specific to the Master.

Each seminar has a teaching load of between 1 and 2 ECTS, and are taught by researchers specialized professor and researchers in disciplines related to the objectives of the Master program.

In addition, most of the participating researchers are professors come from foreign institutions, in order to be able to offer the student the point of view and activity of other centres and research groups, thus enriching the student's education.

The seminars take place in workshops agreed with the investigators based on their availability, so a full closed schedule and planning can't be given.

The teaching schedule is compatible with that of the other subjects.