

TELEMATICS ENGINEERING B. Eng.

SEMESTER 6

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**Year 2015/16**

<b>Course Name:</b>	Digital Signal Processing	<b>Course Code:</b>	595000224
<b>Year:</b>	2	<b>Semester:</b>	4
<b>Credits (ECTS):</b>	4,5	<b>Credit Hours:</b>	3
<b>Area:</b>	Communication Systems	<b>Type:</b>	Basic / Required
<b>Term:</b>	Fall / Spring	<b>Language:</b>	Spanish
<b>Prerequisites / Co-requisites:</b>		Calculus I, Lineal Algebra Calculus II, Signals and Systems	
<b>Coordinator:</b>		Juan Carlos Gonzalez de Sande	
<b>Bachelor Engineering Program:</b>		Telematics Engineering Communications Electronics Engineering Telecommunications Systems Engineering Sound and Image Engineering	

### Course Contents

1. Continuous digital signal processing
2. Design of digital filters
3. The transform discrete Fourier transform (DFT)

### ABET Student Outcomes

- (a) An ability to apply knowledge of mathematics, science, and engineering
- (b) An ability to design and conduct experiments, as well as to analyze and interpret data
- (c) An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
- (d) An ability to function on multidisciplinary teams
- (g) An ability to communicate effectively
- (h) The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
- (i) A recognition of the need for, and an ability to engage in life-long learning
- (j) A knowledge of contemporary issues

### Study Outcomes (according to the Spanish program definition)

- CG 02 Ability to express oneself in oral and written form, and to convey information through documents and public presentations..
- CG 03 Skilled for public speaking and in written and communicating information throughout documents and public speeches.
- CG 04 Ability to abstract, analyze, and synthesize, and to solve problems.
- CE B4 Knowledge and command of basic concepts on linear systems and related functions and transforms, theory of electrical circuits, electronic circuits,

physical principles of semiconductors and logic families, electronic and photonic devices, materials technology and its application for solving problems of engineering.

CE TEL04 Ability to analyze and specify the fundamental parameters of a communication system.

CE TEL08 Ability to apply signal analysis and treatment and system modeling tools.

### **Specific outcomes of instruction (according to the Spanish program definition)**

- 1.- Perform the convolution of signals.
- 2.- An analysis on frequency of discrete time signals.
- 3.- Linking continuous time systems and systems of discrete time in the time domain.
- 4.- Performing basic operations with signals and functions.
- 5.- Be able to characterize LTI systems of discrete time in the time domain (response to the impulse and constant coefficients linear difference equation) and processed domains (frequency and function of system response).
- 6.- Describe the characteristics of the spectral estimation of sequences with the spectrum of the continuous-time signal from which they come.
- 7.- Characterize and describe mathematically FIR and IIR filters.
- 8.- Designing IIR filters using the bilinear transformation method.
- 9.- Apply the rational change of the sample rate to the solution of problems.
- 10.- Mathematical tools of analysis and design for discrete time systems .
- 11.- Represent the flowchart of digital filters in their basic forms.
- 12.- Determine the parameters of an interpolator.
- 13.- Characterize mathematically the operation of sampling of continuous-time signals.
- 14.- Analysis and characterization of discrete time signals.
- 15.- Calculate the ideally sampled signal spectrum.
- 16.- Relate time continuous signals and time discrete time-domain signals.
- 17.- Relate the linear convolution with the DFT.
- 18.- Differentiate digital according to the characteristics of its impulse response filter types: FIR and IIR filters.
- 19.- Be able to describe the block diagram of a digital signal processing system in real time enumerating the significant parameters of each block.
- 20.- Describe the basic methods for the design of FIR filters.
- 21.- Describe linear phase FIR filters.
- 22.- Describe the principles of the method of sampling in frequency of FIR filter design and relate it to the DFT.
- 23.- Designing IIR filters by using the method of the invariant transformation of impulse.
- 24.- Determine the parameters of a decimator.
- 25.- Consider the solution to problems of sampling rate change.
- 26.- Relate the circular convolution with the DFT.

### **Bibliography**

"Señales y Sistemas", A.V. Oppenheim, A. S., Willsky y S. H. Nawab. Prentice Hall. 2000.

"Tratamiento de Señales en Tiempo Discreto", Oppenheim, Schaffer, Buck., Prentice Hall, 2000.

"Tratamiento digital de señales. Principios, algoritmos y aplicaciones", J.G. Proakis, D.G. Manolakis, , Prentice Hall, 1997.

**Year 2015/16**

<b>Course Name:</b>	Advanced Networks and Services	<b>Course Code:</b>	595000230
<b>Year:</b>	3	<b>Semester:</b>	6
<b>Credits (ECTS):</b>	6	<b>Credit Hours:</b>	4
<b>Area:</b>	Telematics Networks, Systems and Services	<b>Type:</b>	Engineering Topic / Required
<b>Term:</b>	Spring	<b>Language:</b>	Spanish
<b>Prerequisites / Co-requisites:</b>	Programming I Programming II Statistics Telecommunication Networks and Services Computer Networks Signaling and Switching		
<b>Coordinator:</b>	Ana Belén García		
<b>Bachelor Engineering Program:</b>	Telematics Engineering		

### Course Contents

1. Structure and services of circuit-switched networks.
2. VoIP: Voice over IP.
3. Structure and services of packet-switched networks.
4. MPLS AV: Advanced applications of MPLS technology.
5. IPv6: IP version 6.

### ABET Student Outcomes

- (a) An ability to apply knowledge of mathematics, science, and engineering
- (b) An ability to design and conduct experiments, as well as to analyze and interpret data
- (e) An ability to identify, formulate, and solve engineering problems
- (g) An ability to communicate effectively
- (h) The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
- (j) A knowledge of contemporary issues
- (k) An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

### Study Outcomes (according to the Spanish program definition)

- CE TM01 Ability to build, utilize and manage telecommunication services and applications for the acquisition, transport, representation, processing, storage, management and presentation of multimedia information, from the point of view of telematic services.
- CE TM02 Ability to apply techniques on which telematic networks, services and

applications are based, such as management, signaling and switching, routing, security (cryptographic protocols, tunneling, firewalls, digital payment, authentication, and content protection), traffic engineering (graph theory, queuing theory, tele traffic), billing, reliability and quality of service, whether in fixed or mobile environments, local or long distance, with different bandwidths, including telephony and data.

- CE TM05 Ability to advance with the technological progress in the areas of transmission, switching and processing in order to improve networks and telematic services.
- CG 02 Ability to express oneself in oral and written form, and to convey information through documents and public presentations..
- CG 03 Skilled for public speaking and in written and communicating information throughout documents and public speeches.
- CG 04 Ability to abstract, analyze, and synthesize, and to solve problems.
- CG 05 Ability for teamwork in multidisciplinary environments.
- CG 10 Ability to handle specifications, rules and regulations and to apply them in the practice of the profession.

### **Specific outcomes of instruction (according to the Spanish program definition)**

- 1.- Describe the structure, signaling and services used in the intelligent network.
- 2.- Explain the different existing modes of interoperability between IP and ATM networks.
- 3.- Describe QoS solutions and new services over IPv6.
- 4.- Apply knowledge of IP networks to the configuration and management of a network with dynamic routing.
- 5.- Apply knowledge of circuit-switched networks to the configuration and management of a real network.
- 6.- Describe the technologies and procedures used in the access to packet-switched networks.
- 7.- Apply knowledge about networks to the design and sizing of a global network that can meet the needs of basic and advanced telecommunication services of an organization, SMEs, etc. implanted in Spain and with international headquarters.
- 8.- Justify the motivations and technical implications related to voice over IP.
- 9.- Justify the advantages of the IPv6 protocol vs IPv4.
- 10.- Describe in detail the structure and services of the main types of current circuit-switched networks.
- 11.- Describe the mechanisms and protocols used for the provision of advanced MPLS services.
- 12.- Describe the functionality and features of the protocols used in a VoIP network control and user plane.

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Travis Russell. "Signaling System #7". McGraw-Hill Professional, 2006.

Harry G. Perros. "Connection-oriented networks: SONET/SDH, ATM, MPLS and optical networks". John Wiley & Sons, 2005.

Olivier Hersent. "IP telephony: packet-based multimedia communications systems". Pearson Education, 2000.

**Year 2015/16**

<b>Course Name:</b>	Networks and Services Security	<b>Course Code:</b>	595000231
<b>Year:</b>	3	<b>Semester:</b>	6
<b>Credits (ECTS):</b>	6	<b>Credit Hours:</b>	4
<b>Area:</b>	Telematics Networks, Systems and Services	<b>Type:</b>	Engineering Topic / Required
<b>Term:</b>	Spring	<b>Language:</b>	Spanish
<b>Prerequisites / Co-requisites:</b>	Programming II Computer Networks Telecommunication Networks and Services		
<b>Coordinator:</b>	Ana Gómez		
<b>Bachelor Engineering Program:</b>	Telematics Engineering		

### Course Contents

1. General approaches on the security of networks and services
2. Security Infrastructures
3. Spanish legislation on information security. Recommendations and safety audits
4. Cybersecurity Applications

### ABET Student Outcomes

- (a) An ability to apply knowledge of mathematics, science, and engineering
- (e) An ability to identify, formulate, and solve engineering problems (g) An ability to communicate effectively
- (h) The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
- (g) An ability to communicate effectively
- (j) A knowledge of contemporary issues
- (k) An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

### Study Outcomes (according to the Spanish program definition)

- CE TM01 Ability to build, utilize and manage telecommunication services and applications for the acquisition, transport, representation, processing, storage, management and presentation of multimedia information, from the point of view of telematic services.
- CE TM02 Ability to apply techniques on which telematic networks, services and applications are based, such as management, signaling and switching, routing, security (cryptographic protocols, tunneling, firewalls, digital payment, authentication, and content protection), traffic engineering (graph theory,

queuing theory, tele traffic), billing, reliability and quality of service, whether in fixed or mobile environments, local or long distance, with different bandwidths, including telephony and data.

- CE TM05 Ability to advance with the technological progress in the areas of transmission, switching and processing in order to improve networks and telematic services.
- CG 02 Ability to express oneself in oral and written form, and to convey information through documents and public presentations..
- CG 05 Ability for teamwork in multidisciplinary environments.

### **Specific outcomes of instruction (according to the Spanish program definition)**

- 1.- Set the advanced capabilities of the X 509 certification.
- 2.- Designing and defining the most optimal solution for a specific telematics system that meets its security requirements.
- 3.- Indicate and describe the existing regulation regarding the approval of cryptographic systems.
- 4.- Describe the elements, structure and capabilities of the cryptographic tokens.
- 5.- Analyze the risks and vulnerabilities of networks and their systems.
- 6.- Describe the most commonly used security mechanisms for protecting networks and systems-level transport.
- 7.- Describe traditional security services used in telematics mechanisms such as email and Web service.
- 8.- Indicate the most significant aspects in relation to the standards for smart cards.
- 9.- Describe the most commonly used security mechanisms for the protection of networks and network-level systems.
- 10.- Define the protocols of action for efficient management of the security of networks and systems in accordance with standards and recommendations in force.
- 11.- Describe the basic security services in telematics networks.
- 12.- Describe the mathematical foundations of modern cryptology.
- 13.- Describe algorithms commonly used in secret-key and public-key cryptosystems.
- 14.- Establish a comparison between public-key and symmetric-key cryptosystems.
- 15.- Describe the elements, structure and capacities of key distribution infrastructure.

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Carracedo, J. Seguridad en Redes Telemáticas. Mc Graw Hill. 2004

Stallings, William Network security essentials : applications and standards Pearson Prentice Hall,  
2007



**Year 2015/16**

<b>Course Name:</b>	Information Processing in Telematic Applications	<b>Course Code:</b>	595000232
<b>Year:</b>	3	<b>Semester:</b>	6
<b>Credits (ECTS):</b>	4.5	<b>Credit Hours:</b>	4
<b>Area:</b>	Telematics Applications	<b>Type:</b>	Engineering Topic / Required
<b>Term:</b>	Spring	<b>Language:</b>	Spanish
<b>Prerequisites / Co-requisites:</b>	Programming II Telecommunication Networks and Services Advanced Application Programming Modeling Languages		
<b>Coordinator:</b>	Gregorio Rubio		
<b>Bachelor Engineering Program:</b>	Telematics Engineering		

### Course Contents

1. Introduction
2. Information Modeling
3. Data Manipulation
4. Data Representation

### ABET Student Outcomes

- (a) An ability to apply knowledge of mathematics, science, and engineering
- (b) An ability to design and conduct experiments, as well as to analyze and interpret data
- (c) An ability to identify, formulate, and solve engineering problems
- (d) An ability to communicate effectively
- (e) An ability to communicate effectively
- (f) An ability to communicate effectively
- (g) An ability to communicate effectively
- (h) The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
- (i) A knowledge of contemporary issues
- (j) A knowledge of contemporary issues
- (k) An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

### Study Outcomes (according to the Spanish program definition)

- CE TM06 Ability to design telematic network and service architectures.
- CE TM07 Ability to program networked, distributed, or interactive services and applications, taking into account usability and accessibility criteria.
- CG 02 Ability to express oneself in oral and written form, and to convey information

- through documents and public presentations..
- CG 03 Skilled for public speaking and in written and communicating information throughout documents and public speeches.
- CG 04 Ability to abstract, analyze, and synthesize, and to solve problems.
- CG 10 Ability to handle specifications, rules and regulations and to apply them in the practice of the profession.
- CG 11 Skills for the use of Information and Communication Technologies..
- CG 13 Learning skills with a high degree of autonomy.

**Specific outcomes of instruction (according to the Spanish program definition)**

- 1.- Be able to use mechanisms of data location in documents generated from an abstract representation of data.
- 2.- Ability to determine the mechanism of exchange of data most suitable for each telematics application.
- 3.- Learn about the use of technologies used in the telematics environment.
- 4.- Learn about the manipulation strategies and mechanisms which are specified abstractly.
- 5.- Be able to generate specific representations from abstract representations of data.
- 6.- Know the paradigms of abstract representation of data.
- 7.- Learn about the operation of the telematics applications.
- 8.- Ability to analyze data and manipulating them in the exchange of data between telematics applications.
- 9.- Ability to apply the techniques of manipulation of the modeled data.

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- NEIL BRADLEY. The XML Companion. Addison-Wesley
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