

TELEMATICS ENGINEERING B. Eng.

SEMESTER 5

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Year 2015/16

Course Name:	Economics and Business Management	Course Code:	595000223
Year:	3	Semester:	5
Credits (ECTS):	4,5	Credit Hours:	3
Area:	Organization Engineering	Type:	Basic / Required
Term:	Fall	Language:	Spanish
Prerequisites / Co-requisites:		None	
Coordinator:		Waldo Pérez	
Bachelor Engineering Program:		Telematics Engineering Communications Electronics Engineering Telecommunications Systems Engineering Sound and Image Engineering	

Course Contents

1. Enterprise theory and markets
2. Behavior, specialization and exchange
3. Democratic governance and contractual process
4. Company and entrepreneur
5. Legal status and company governance
6. Financial information I
7. Financial information II
8. The strategic process: objectives and analysis
9. Strategies and business model

ABET Student Outcomes

- (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
- (k) An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

Study Outcomes (according to the Spanish program definition)

CG 03 Skilled for public speaking and in written and communicating information

- throughout documents and public speeches..
- CG 05 Ability for teamwork in multidisciplinary environments.
- CG 06 Ability for adaptability, negotiation, conflict resolution and leadership.
- CG 08 Ability to organize, plan and make decisions.
- CE B5 Acceptable knowledge of the concept of company, institutional and juridical frame of the company. Companies Organization and management.
- CE TEL 01 Ability to use communication and computer applications (office automation, databases, advanced calculus, project management, visualization...) to support the development and utilization of networks, services and telecommunication and electronics applicati
- CE TEL 02 Ability to use applications of communication and computer (office automation, databases, advanced calculus, management of projects, visualization...) to support the development and utilization of nets, services and applications of telecommunication and electronics.
- CE TEL 06 Knowledge and use of the principles of programming in telecommunication networks, systems and services.ntinuous improvement, as well as knowing their economic and social impact.

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

- 1.- Recognize memory and other financial documents that are part of the annual accounts
- 2.- Distinguish the main features of the other corporations
- 3.- Recognize the main tools for external strategic analysis
- 4.- Extending the model of behavior of economic agents as utility maximizers for situations where operating with imperfect information
- 5.- Approaching the issue of company governance
- 6.- Explain a model of behavior of economic agents as utility maximizers that have perfect information
- 7.- Interpret the market, political and organizational solutions as various complementary solutions to the economic problem
- 8.- Conceptualize the organization as complex form of hiring
- 9.- Become familiar with the different meanings of businessman
- 10.- Know the main characteristics of the individual entrepreneur and unincorporated partnerships
- 11.- Recognizing the level of debt and working capital from financial information
- 12.- Analyze the profitability of a company from the information provided in the annual accounts
- 13.- Identify the model of behavior of the final consumer
- 14.- Describe the model of company behavior characterized by a transformation function, both from the point of view of production and costs
- 15.- Recognize the pattern of market behavior in perfect competition and monopoly, with interest in their differences

Bibliography

“Economía y Empresa para Ingenieros”, Martínez Núñez, M.; Pérez Aguiar, W. S., Dpt. Publicacions, 2014.

Year 2015/16

Course Name:	Operating Systems	Course Code:	595000225
Year:	3	Semester:	5
Credits (ECTS):	4,5	Credit Hours:	3
Area:	Informatics	Type:	Engineering Topic / Required
Term:	Fall	Language:	Spanish
Prerequisites / Co-requisites:	Programming I Programming II Telecommunication Networks and Services Microprocessors		
Coordinator:	Javier Martín		
Bachelor Engineering Program:	Telematics Engineering Communications Electronics Engineering Telecommunications Systems Engineering Sound and Image Engineering		

Course Contents

1. Concepts, objectives and components of the operating system
2. Processor management
3. Memory management
4. Concurrency
5. Input/output management
6. Files system

ABET Student Outcomes

- (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
- (k) An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

Study Outcomes (according to the Spanish program definition)

CG 04 Ability to abstract, analyze, and synthesize, and to solve problems.

- CG 05 Ability for teamwork in multidisciplinary environments.
- CG 08 Ability to organize, plan and make decisions.
- CG 11 Skills for the use of Information and Communication Technologies..
- CG 13 Learning skills with a high degree of autonomy.
- CE B2 Basic knowledge on using and programming computers, operating systems, databases and software used in engineering.
- CE TEL 07 Knowledge and use of the principles of programming in telecommunication networks, systems and services.

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

- 1.- Install and use a multi-programmed general purpose operating system.
- 2.- Learn general principles about general purpose and real time operating systems, as well as the basic mechanisms of resource management.
- 3.- Use Unix systems to develop applications in the field of telecommunications.
- 4.- Carry out a top-down design of an application from a medium complexity problem specification.
- 5.- Use the POSIX system calls.
- 6.- Program in a high-level language, applications of complexity half according to the rules of structured programming.
- 7.- Use standard application development tools for a general purpose operating system.
- 8.- Understand the specific problems of concurrent applications. Learn the basic tools for developing applications with these characteristics.

Bibliography

Moodle Resources

Year 2015/16

Course Name:	Modeling Languages	Course Code:	595000226
Year:	3	Semester:	5
Credits (ECTS):	4,5	Credit Hours:	3
Area:	Application Programming	Type:	Engineering Topic / Required
Term:	Fall	Language:	Spanish
Prerequisites / Co-requisites:		Telecommunication Networks and Services Computer Networks Advanced Application Programming	
Coordinator:		José Fernán Martínez	
Bachelor Engineering Program:		Telematics Engineering	

Course Contents

1. Modeling Introduction
2. UML Modeling
3. Requisite Modeling
4. Design Modeling: Architecture
5. Design Modeling: Detailed Design

ABET Student Outcomes

- (b) An ability to design and conduct experiments, as well as to analyze and interpret data
- (d) An ability to function on multidisciplinary teams
- (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 TEL02 Ability to use applications of communication and computer (office automation, databases, advanced calculus, management of projects, visualization...) to support the development and utilization of nets, services and applications of telecommunication and electronics.
- CE TEL07 Knowledge and use of the principles of programming in telecommunication networks, systems and services.

- 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 06 Ability for adaptability, negotiation, conflict resolution and leadership.
- CG 08 Ability to organize, plan and make decisions.
- CG 10 Ability to handle specifications, rules and regulations and to apply them in the practice of the profession.
- CG 13 Learning skills with a high degree of autonomy.

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

- 1.- Understand the basic concepts of system modeling.
- 2.- Understand and apply modeling techniques for the design and specification of the architecture of a complex system.
- 3.- Ability to specify complex systems through the use of architectural modeling techniques .
- 4.- Apply the concepts of a modeling language for the analysis of requirements of a complex system.
- 5.- Ability to model complex systems using standard modeling languages.
- 6.- Ability to use patterns that may serve as basis for the resolution of common situations in applications design.
- 7.- Ability to use advanced techniques for the validation and verification of complex systems.

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Grady BOOCH, James RUMBAUGH, Ivar JACOBSON. The Unified Modeling Language. User Guide. Ed. Addison Wesley. Massachusetts

Perdita STEVENS, Utilización de UML en ingeniería del software con objetos y componentes, Pearson Addison Wesley,

Erich GAMMA, Richard HELM, Ralph JOHNSON y John VLISSIDES. Patrones de diseño: elementos de software orientado a objetos reutilizable. Ed. Pearson

Roger S. PRESSMAN. Ingeniería del software: un enfoque práctico. Adaptación europea. 5ª edición. McGraw-Hill

Year 2015/16

Course Name:	Signaling and Switching	Course Code:	595000227
Year:	3	Semester:	5
Credits (ECTS):	6	Credit Hours:	4
Area:	Telematics Networks, Systems and Services	Type:	Engineering Topic / Required
Term:	Fall	Language:	Spanish
Prerequisites / Co-requisites:		Telecommunication Networks and Services Computer Networks Statistics and Stochastic Processes	
Coordinator:		Ana Belén García	
Bachelor Engineering Program:		Telematics Engineering	

Course Contents

1. Basic functions in a telecommunication network
2. CP subject: Packet switching techniques: advanced concepts and protocols
3. QoS: Characterization of traffic and quality of service
4. SS7 topic: Channel common No. 7 signaling system 7

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
- (d) An ability to function on multidisciplinary teams
- (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 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.

CE TM08	Ability to carry out professional projects in the specific field of telecommunication technologies in which competences attained in the program have to be synthesized and integrated.
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 05	Ability for teamwork in multidisciplinary environments.
CG 06	Ability for adaptability, negotiation, conflict resolution and leadership.
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 functionality of each of the protocols that form the SS7 architecture.
- 2.- Determine protocols and functions of signaling involved in the provision of services in a telecommunication network.
- 3.- Identify the basic functions of a telecommunications network.
- 4.- Sizing up resources of a simple network using traffic engineering principles.
- 5.- Apply the knowledge on QoS and traffic management to the configuration and analysis of a real scenario.
- 6.- Set up a network that uses a connection-oriented packet switching technology.
- 7.- Define the parameters that characterize trafficking in origin.
- 8.- Analyze a real flow of signaling traffic.
- 9.- Defining the architecture of the SS7 signaling system.
- 10.- Define the parameters that characterize the quality of service requirements.
- 11.- Define habitual traffic management mechanisms in networks that offer QoS.
- 12.- Explain what type of information is present in a contract traffic, or Service Level Agreement.
- 13.- Define the basic principles and models applied in traffic engineering.
- 14.- Describe the characteristics of the nodes, architectures, protocols and functions of traffic management of the connection-oriented packet-switching technologies.
- 15.- Explain the basic principles of tunneling and VPNS.

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- U.D. Black. "ATM: Internetworking with ATM". Prentice Hall, 1998.

Year 2015/16

Course Name:	Transmission Systems	Course Code:	595000228
Year:	3	Semester:	5
Credits (ECTS):	6	Credit Hours:	3
Area:	Telematics Engineering	Type:	Engineering Topic / Required
Term:	Fall	Language:	Spanish
Prerequisites / Co-requisites:		Communication Theory	
Coordinator:		Antonio Da Silva	
Bachelor Engineering Program:		Telematics Engineering	

Course Contents

1. Introduction to Transmission Systems
2. 2 Mb/s Multiplex Systems
3. Digital Plesiochronous Hierarchy
4. Synchronous Digital Hierarchy (SDH): multiplexing structure
5. Fiber optic based Line Systems
6. Synchronous digital hierarchy: network structure

ABET Student Outcomes

- (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
- (i) A recognition of the need for, and an ability to engage in life-long learning
- (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.
- CE TM08 Ability to carry out professional projects in the specific field of telecommunication technologies in which competences attained in the program have to be synthesized and integrated.
- CG 02 Ability to express oneself in oral and written form, and to convey information through documents and public presentations..
- 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.- Analyze the structure and quality of standardized at 2 MB/s systems.
- 2.- Use the appropriate laboratory equipment for measurement of defects, abnormalities, and quality of the signal transmission in normalized structures according to the European synchronous digital hierarchy.
- 3.- Calculate the bandwidths used in telephony and data communications.
- 4.- Understand the operation of the transmitter and receiver at different levels of the European plesiochronous digital hierarchy .
- 5.- Understand the rules used in the multiplexes of plesiochronous digital hierarchy.
- 6.- Learn about other international standards equivalent to the European ones, relating to the plesiochronous digital hierarchy. .
- 7.- Distinguish the elements that constitute a wide area network .
- 8.- Know the parameters that define the quality of line systems by optical fiber.
- 9.- Understand the problems arising in the integration of plesiochronous digital hierarchy networks with synchronous digital hierarchy networks. .
- 10.- Contextualise a transmission system model applied to a network at a great distance .
- 11.- Use the appropriate laboratory equipment to verify the proper functioning of the European plesiochronous digital hierarchy standard operating systems.
- 12.- Understand the rules used in the multiplex of synchronous digital hierarchy.

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SISTEMAS DE TRANSMISIÓN, ETSIST Publicaciones

Year 2015/16

Course Name:	Audiovisual Systems	Course Code:	595000229
Year:	3	Semester:	5
Credits (ECTS):	4,5	Credit Hours:	3
Area:	Communication Systems	Type:	Engineering Topic / Required
Term:	Spring	Language:	Spanish
Prerequisites / Co-requisites:	Waves Propagation Signals and System Communication Theory		
Coordinator:	Elena Blanco		
Bachelor Engineering Program:	Telematics Engineering Communications Electronics Engineering Telecommunications Systems Engineering Sound and Image Engineering		

Course Contents

1. Capture and playback of sound and image devices
2. Sound and Image signals and formats
3. Introduction to streaming video and audio systems

ABET Student Outcomes

- (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
- (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
- (k) An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

Study Outcomes (according to the Spanish program definition)

- 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.
- CE TEL 04 Ability to analyze and specify the fundamental parameters of a communication

system.

- CE TEL 05 Ability to weigh up the advantages and disadvantages of different technological alternatives to deploy or implement communication systems, from the point of view of signal space, perturbations and noise, and analog and digital modulation systems.gical and digital modulation.
- CE TEL 16 Knowledge of telecommunication legislation and regulations at the National, European and International levels.

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

- 1.- Identify and recognize the technical specifications of the capture and video playback devices.
- 2.- Select from technical specifications device capture video and playback most suitable for a specific use.
- 3.- Describe the scheme of connection of a simple video system.
- 4.- Describe the process of digitalization of the video signal.
- 5.- Identify the formats of storage and transmission of video signals.
- 6.- Identify and recognize the technical specifications of capture and audio playback devices.
- 7.- Select most suitable capture and audio playback device from technical specifications for a specific use.
- 8.- Describe the connection scheme of a simple audio system.
- 9.- Describe the process of digitalization of the audio signal.
- 10.- Identify the storage formats and transmission of audio signals.
- 11.- Recognize the basic characteristics of by cable, fiber optic, radio link and satellite transmission system.
- 12.- Calculate the basic settings (bandwidth, power and s/n) of satellites, radio link, optical fiber and cable communications system.

Bibliography

- “Transmisión por radio”, Hernando Rábanos, J.M., Centro de estudios Ramón Areces.
- “Micrófonos”, Sánchez Bote, J.L. Dpto. Publicaciones EUITT.