TELEMATICS ENGINEERING B. Eng.

SEMESTER 4

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Year 2015/16

Course Name:	Science, Technology and Society	**Course Code:**	595000217
Year:	2	**Semester:**	4
Credits (ECTS):	3	**Credit Hours:**	2
Area:	Common UPM Skills	**Type:**	Basic / Required
Term:	Spring	**Language:**	Spanish
Prerequisites / Co-requisites:		None	
Coordinator:		Eloy Portillo	
Bachelor Engineering Program:		Telematics Engineering Communications Electronics Engineering Telecommunications Systems Engineering Sound and Image Engineering	

Course Contents

1. Printing, Renaissance and first globalization
2. Scientific spirit and ingenuity Machinist
3. The scientific revolution
4. The revolutions of the 18th century
5. Progress and development capitalists
6. Technological determinism and ethics in engineering
7. Telecommunications economy
8. Environmental crisis and "grey ecology"
9. Sociology of telecommunications
10. Critical theory of postmodernism

ABET Student Outcomes

(d) An ability to function on multidisciplinary teams

(f) An understanding of professional and ethical responsibility

(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

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 05 Ability for teamwork in multidisciplinary environments.

CG 06 Ability for adaptability, negotiation, conflict resolution and leadership.

CG 09 Ability to analyze and assess the social and environmental impact of technical solutions.

CE B3 Knowledge and command of basic concepts on the general laws of Mechanics, Thermodynamics, electromagnetic fields and waves, and its application to solve engineering problems.

CE TEL 03 Ability to use computer tools of search of bibliographical resources or of information related to the telecommunications and the electronics.

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.- Locate the required information correctly.
2.- Analyze the information found and discard the irrelevant.
3.- Process the information from different sources and synthesize it properly.
4.- Contrast the ideas contributed by different sources.
5.- -Make an assessment about the rigor of the source of origin of information.
6.- Relate the scientific and technological aspects with a social environment of increasing complexity: social, economic, political, legal, ethical and environmental aspects.

Bibliography

"Ciencia, tecnología y sociedad. Una introducción al estudio social de la ciencia y la tecnología", González, M. I.; López Cerezo, J. A. y Luján, J. L., 1996.

Year 2015/16

Course Name:	Wave Propagation	**Course Code:**	595000218
Year:	2	**Semester:**	4
Credits (ECTS):	4,5	**Credit Hours:**	3
Area:	Physics	**Type:**	Basic / Required
Term:	Fall / Spring	**Language:**	Spanish
Prerequisites / Co-requisites:		Calculus I Lineal Algebra Calculus II Electromagnetism and Waves	
Coordinator:		Emma Acosta	
Bachelor Engineering Program:		Telematics Engineering Communications Electronics Engineering Telecommunications Systems Engineering Sound and Image Engineering	

Course Contents

1. Vector operators
2. Plane acoustic waves
3. Spherical acoustic waves
4. Stationary acoustic waves
5. Maxwell equations. Wave equation. Energy
6. Propagation of electromagnetic waves in a dielectric medium
7. Propagation of electromagnetic waves in conductive media
8. Reflection and refraction
9. Guided waves
10. Radiation of electromagnetic waves

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

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

CG 13 Learning skills with a high degree of autonomy.

CE B3 Knowledge and command of basic concepts on the general laws of Mechanics, Thermodynamics, electromagnetic fields and waves, and its application to solve engineering problems.

CE TEL 09 Ability to understand the mechanisms of propagation and transmission of electromagnetic and acoustic waves, and their transmitters and receivers.

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

1. Analyze fundamental characteristics of wave propagation.
2. Analyze the phenomenology associated with the electrostatic field.
3. Analyze the propagation of electromagnetic waves in media dielectrics and conductors.
4. Understand and analyze the meaning of Maxwell's equations and its consequences.
5. Understand the basic properties of materials that are based on devices.
6. Analyze the key characteristics of the magnetic field.
7. Analyze the phenomenology associated with oscillations.
8. Analyze fundamental characteristics of electromagnetic fields and electromagnetic waves.
9. Analyze the effect of boundary conditions, as well as the guided electromagnetic wave propagation.
10. Analyze the phenomena associated with radiation.
11. Analyze flat and spherical acoustic waves in media limited and unlimited.

Bibliography

"Elementos de electromagnetismo", Matthew N. O., Sadiku Edición 3ª, Editorial Oxford University Press.

"Fundamentos de la teoría electromagnética", Reitz, Milford y Christy, Editorial Pearson Educación.

"Campos y ondas electromagnéticos", P. Lorrain y D:R: Corson, Editorial Selecciones Científicas.

"Fundamentos de Acústica", L.E. Kinsler, A.R. Frey, A.B. Coppens y J.V., Sanders. Editorial Limusa.

Year 2015/16

Course Name:	Computer Networks	**Course Code:**	595000219
Year:	3	**Semester:**	6
Credits (ECTS):	4,5	**Credit Hours:**	3
Area:	Telecommunications Networks	**Type:**	Engineering Topic / Required
Term:	Spring	**Language:**	Spanish
Prerequisites / Co-requisites:		Telecommunication Networks and Services	
Coordinator:		Oscar Ortiz	
Bachelor Engineering Program:		Telematics Engineering Sound and Image Engineering Communications Electronics Engineering Telecommunications Systems Engineering	

Course Contents

1. Link layer and Local Area Networks
2. Internet Network Layer
3. Internet Transport Layer
4. Introduction to Internet Applications and Services

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

(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

(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 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.

CE TEL 13 Knowledge and use of the concepts of network architecture, protocols and communication interfaces.

CE TEL 14 Ability to differentiate the concepts of access and transport network, packet and circuit switching network, fixed and mobile network, as well as distributed systems and networked applications, voice, data, audio, video, interactive and multimedia services.

CE TEL 15 Knowledge of methods of interconnecting networks and routing, fundamentals of planning and networks dimensioning basing on traffic parameters.

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

1.- Contextualize the local area in the Internet architecture networks.
2.- Enumerate the physical media for the deployment of local area networks.
3.- Explain the problem and the classical solutions to the shared media access control.
4.- Describe the characteristics and operation of Ethernet.
5.- Identify local area networking devices.
6.- Describe the level of Internet protocols.
7.- Describe the different Internet routing algorithms and protocols.
8.- Indicate the structure of bodies involved in the Organization of Internet.
9.- Describe the level of Internet transport protocols.
10.- The relationship between the Internet level and the link layer protocols.
11.- Differentiate the Internet networking elements.
12.- Describe the main Internet services and applications.
13.- Set up an IP computers network.

Bibliography

"Redes de computadoras: un enfoque descendente", Kurose, J.F., Ross, K.W., Pearson Addison Wesley, 2010

"Comunicaciones y Redes de Ordenadores" Stallings, Séptima Edición W., Prentice-Hall International, 2004.

"Redes de computadores e Internet", Halsall, F., Pearson, Addison-Wesley, 2006

Year 2015/16

Course Name:	Microprocessors	**Course Code:**	595000220
Year:	2	**Semester:**	4
Credits (ECTS):	6	**Credit Hours:**	4
Area:	Fundamentals of Electronics	**Type:**	Basic / Required
Term:	Fall / Spring	**Language:**	Spanish
Prerequisites / Co-requisites:		Programming I Electronics I	
Coordinator:		Juan Manuel López	
Bachelor Engineering Program:		Telematics Engineering Communications Electronics Engineering Telecommunications Systems Engineering Sound and Image Engineering	

Course Contents

1. Introduction to microprocessor systems
2. Processor Cortex M0
3. Programming techniques

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

(f) An understanding of professional and ethical responsibility

(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 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 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 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 TEL10 Ability to analyze and design combinational and sequential circuits, synchronous and asynchronous, and to use microprocessors and integrated circuits.

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

1. Use the microprocessor peripherals to develop applications which solve problems of medium complexity.
2. Design the logic necessary to connect memory and peripherals for input/output in a digital system based on microprocessor, respecting the timing established in their machine cycles.
3. Perform simple programs in Assembly language and high level for a commercial microprocessor Language:.
4. Understand the functionality and interface subsystems combinational, sequential, and memories.
5. Understand the principles of operation of some basic peripherals: serial port, parallel port, timers, etc.
6. Learn about the architecture, features, and operation of a commercial microprocessor.
7. Understand the different techniques of input/output for the exchange of data between a microprocessor-based system and other systems.
8. Understand the principles of operation of a microprocessor, the basic elements that make up its architecture, and digital circuits comprising a microprocessor-based system.

Bibliography

"Manual del procesador Cortex-M0”

Year 2015/16

Course Name:	Communication Theory	**Course Code:**	595000221
Year:	2	**Semester:**	4
Credits (ECTS):	6	**Credit Hours:**	4
Area:	Communication Systems	**Type:**	Basic / Required
Term:	Fall / Spring	**Language:**	Spanish
Prerequisites / Co-requisites:		Signals and Systems	
Coordinator:		Pedro García	
Bachelor Engineering Program:		Telematics Engineering Communications Electronics Engineering Telecommunications Systems Engineering Sound and Image Engineering	

Course Contents

1. Model of a communication system
2. Signals
3. Noise
4. Distortion
5. Analog Modulation
6. A/D Conversion. MIC System
7. Filtered Base-band digital transmission
8. Base band Digital transmission with noise
9. Digital Modulation

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

(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

(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 02	Ability to express oneself in oral and written form, and to convey information through documents and public presentations..
CG 04	Ability to abstract, analyze, and synthesize, and to solve problems.
CG 05	Ability for teamwork in multidisciplinary environments.
CG 09	Ability to analyze and assess the social and environmental impact of technical solutions.
CG 11	Skills for the use of Information and Communication Technologies..
CE TEL 01	Capacidad para aprender de manera autónoma nuevos conocimientos y técnicas adecuados para la concepción, el desarrollo o la explotación de sistemas y servicios de telecomunicación.
CE TEL 03	Ability to use computer tools of search of bibliographical resources or of information related to the telecommunications and the electronics.
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 TEL10	Ability to analyze and design combinational and sequential circuits, synchronous and asynchronous, and to use microprocessors and integrated circuits.
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.- Relate the technical aspects with the social environment. Aspects of market, regulatory environment.

2.- Analyze the process of modulation and demodulation, analog and digital.

3.- Interpret and characterize the signal parameters in terms of power, wide bandwidth and quality of telecommunication systems (relations signal to noise or interference, distortion and error probability).

4.- Analyze the structure, performance and applications of telecommunication systems.

5.- Characterizing elements and technologies of transit, distribution, access and user networks.

6.- Understand and manage base-band and modulated signals.

Bibliography

"Apuntes de Teoría", Dpto. Publicaciones.

"Manual de Practicas", Dpto. Publicaciones.

"Libro de Problemas", Dpto. Publicaciones.

Course Name:	Advanced Application Programming	**Course Code:**	595000222
Year:	2	**Semester:**	4
Credits (ECTS):	6	**Credit Hours:**	4
Area:	Application Programming	**Type:**	Basic / Required
Term:	Spring	**Language:**	Spanish
Prerequisites / Co-requisites:		Programming I Programming II	
Coordinator:		Pablo Ramírez	
Bachelor Engineering Program:		Telematics Engineering	

Course Contents

1. Multilayer Architectures
2. Graphic User Applications Development
3. Java Server Applications for Web

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

(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 TM04 Ability to describe, program, validate and optimize communication protocols and interfaces at the different levels of a network architecture.

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.

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

1.- Indicate and describe the existing regulation regarding the approval of cryptographic systems.

2.- Establish a comparison between public key and symmetric key cryptosystems.

3.- Set the advanced capabilities of the X509 certification.

4.- Describe the basic security services in telematic networks.

5.- Describe algorithms commonly used in secret-key and public-key cryptosystems.

6.- Describe the mathematical foundations of modern cryptology.

7.- Describe the elements, structure and capacities of key distribution infrastructure.

Bibliography

Ken Arnold, James Gosling y David Holmes. El lenguaje de programación Java. Addison Wesley. 2001. 3ª Edición.

Bruce Eckel. "Thinking in Java". Ed. Prentice Hall.