SOUND AND IMAGE ENGINEERING
B. Eng.

SEMESTER 3

Table of Contents

Electromagnetism and Waves 3
Statistics and Stochastic Processes 5
Electronics II 7
Telecommunication Networks and Services 9
Signals and Systems 11

Year 2015/16

Course Name:	Electromagnetism and Waves	**Course Code:**	595000112
Year:	2	**Semester:**	3
Credits (ECTS):	6	**Credit Hours:**	4
Area:	Physics	**Type:**	Basic / Required
Term:	Fall / Spring	**Language:**	Spanish
Prerequisites / Co-requisites:		Calculus I Lineal Algebra Calculus II	
Coordinator:		Marta Sánchez	
Bachelor Engineering Program:		Sound and Image Engineering Communications Electronics Engineering Telecommunications Systems Engineering Telematics Engineering	

Course Contents

1. Oscillations
2. Waves in elastic media
3. Electrostatics
4. Magnetostatics
5. Electro-magnetic fields

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 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 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 electromagnetic and acoustic wave propagation and transmission, as well as corresponding transmitters and receivers.

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

1. Ability to calculate work and energy and use the principles of conservation.
2. Understand and analyze the harmonic oscillations.
3. Know and use the function and the equation of waves.
4. Understand the mechanisms associated with the propagation of waves in elastic media.
5. Understand and analyze the process of interference and standing waves.
6. Know and apply Gauss's law for electric field in vacuum and material means.
7. Understand and use the relationship between field and electric potential.
8. Understand and use the concepts of density and current and the continuity equation.
9. Know and estimate the effects of magnetic fields on electrical currents and material means.
10. Know and apply the theorem of Ampere in vacuum and material means.
11. Know and use the Faraday law of electro-magnetic induction and calculate the magnetic energy.
12. Know and apply the Ampère-Maxwell law.
13. Understand Maxwell's equations in integral form**.**

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"Problemas de Física resueltos", Departamento de Física Aplicada.

Year 2015/16

Course Name:	Statistics and Stochastic Processes	**Course Code:**	595000113
Year:	2	**Semester:**	3
Credits (ECTS):	6	**Credit Hours:**	4
Area:	Mathematics	**Type:**	Basic / Required
Term:	Fall / Spring	**Language:**	Spanish
Prerequisites / Co-requisites:		Calculus I; Lineal Algebra Calculus II	
Coordinator:		Carmen Cousido	
Bachelor Engineering Program:		Sound and Image Engineering Communications Electronics Engineering Telecommunications Systems Engineering Telematics Engineering	

Course Contents

1. Probability
2. Random Variables
3. Random vectors
4. Statistic inference
5. Stochastic processes
6. Practices with statistic software

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 02 Ability to search and select information, develop critical thinking and produce and defend arguments within the area.

CG 03 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.

CE-B1 - Ability to solve mathematic problems that may come up in engineering. Ability to apply knowledge on: linear algebra, geometry, differential geometry, differential and integral calculus, differential equations, partial-differential equations, numeric methods, numeric algorithms, statistics and optimization.

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

1.- Calculate the distribution of a function of one or more independent random variable.
2.- Handle numerical and graphical statistical data analysis tools.
3.- Know and apply processes Poisson and normal.
4.- Calculate marginal and conditional distributions. Calculate odds and moments of multi-dimensional random variables.
5.- Understand the concepts of random variable and associated probability distribution.
6.- Calculate odds and moments of discrete random variables. Know and apply the Poisson and negative binomial, geometric, binomial models.
7.- Know and apply the normal multidimensional models and multinomial.
8.- Understand the concept of probability. Know their properties. Apply the fundamental theorems of calculus of probabilities.
9.- Know the main statistical sample and the sampling distribution.
10.- -Calculate odds and moments of continuous random variables. Know and apply uniform, normal and exponential models.
11. Understand the concepts of multi-dimensional random variable and associated probability distribution.
12. Understand and apply the independence of random variables.
13.- Information about the law of probabilities governing a random phenomenon based on observations of the same.
14.- Learn the basics of stochastic processes. Characterize stationary processes. Calculate the average, autocorrelation and spectral density of a process.
15.- Apply the techniques and probabilistic models to solve problems in telecommunications.
16.- Apply the tools which can treat systems where signs in the presence of uncertainty.

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"Cálculo de Probabilidades y Estadística", Fernández Abascal, Ed. Ariel.

"Probability, Statistics and Random Processes for Electrical Engineering", A León-García, Ed. Mc Graw Hill.

"Estadística, modelos y métodos", D. Peña, Ed. Alianza Universidad.

"Random Signals", Shanmugan, Ed. Wiley.

"Introduction to Probability Models", S. M. Ross, Ed. Academic Press

Year 2015/16

Course Name:	Electronics II	**Course Code:**	595000114
Year:	2	**Semester:**	3
Credits (ECTS):	6	**Credit Hours:**	4
Area:	Fundamentals of Electronics	**Type:**	Basic / Required
Term:	Fall / Spring	**Language:**	Spanish
Prerequisites / Co-requisites:		Electronics I Lineal Algebra Calculus II	
Coordinator:		Manuel César Rodríguez	
Bachelor Engineering Program:		Sound and Image Engineering Communications Electronics Engineering Telecommunications Systems Engineering Telematics Engineering	

Course Contents

1. Coding, Boole Algebra, logic circuits
2. Digital Circuits Technology
3. Combinational circuits

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

(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

(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 search and select information, develop critical thinking and produce and defend arguments within the area.

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

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 to solve engineering problems.

CE TEL 10 Ability to analyze and design combinational and sequential circuits, synchronous and asynchronous, and to use microprocessors and integrated circuits.

CE TEL 11 Knowledge and application of the fundamentals of hardware description languages.

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

1. Understand the functionality and interface of the sequential subsystems.
2. Understand HDL of combinational circuits and sequential simple synchronous modeling.
3. Apply CAD tools for capturing and simulation of simple digital circuits.
4. Understand the mechanisms associated with the propagation of waves in elastic media.
5. Apply CAD tools for the technological realization of electronic circuits.
6. Apply the mathematical tools used for analysis and design of digital circuits.
7. Understand the functionality and interface of the combinational subsystems.
8. Design and verify sequential circuits.
9. Design and verify combinational circuits.
10. Understand the technological foundations for the realization of digital circuits.

Bibliography

Moodle Resources

Year 2015/16

Course Name:	Telecommunication Networks and Services	**Course Code:**	595000115
Year:	2	**Semester:**	3
Credits (ECTS):	6	**Credit Hours:**	4
Area:	Computer Networks	**Type:**	Basic / Required
Term:	Fall / Spring	**Language:**	Spanish
Prerequisites / Co-requisites:		Programing II	
Coordinator:		Oscar Ortiz	
Bachelor Engineering Program:		Sound and Image Engineering Communications Electronics Engineering Telecommunications Systems Engineering Telematics Engineering	

Course Contents

1. INTRODUCTION TO TELECOMMUNICATIONS NETWORKS
2. STRATIFIED INTO LEVELS COMMUNICATION ARCHITECTURES
3. ARCHITECTURE CENTRES OF SWITCHING AND SIGNALLING IN TELECOMMUNICATIONS NETWORKS
4. INTRODUCTION TO THE PROTOCOLS AND SECURITY 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 03 Ability to express oneself in oral and written form, and to convey information through documents and public presentations.

CE TEL 01 Ability to independently learn new knowledge and skills adequate for the design,

development or utilization of telecommunication systems and services.

CE TEL 06 Ability to design, deploy, organize and manage telecommunication networks, systems, services and infrastructures in residential (home, city and digital communities), business or institutional contexts, including setup, continuous improvement, and understanding of their economic and social impact.

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 network interconnection and routing methods, and of the fundamentals of network planning and dimensioning based on traffic parameters.

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

1. Describe the functionality of each level of a tiered architecture.
2. Classify telecommunications networks according to the geographical area.
3. Recognize the need for stratified models of communication architectures.
4. Develop a protocol for communication with basic flow control and control of errors, segmentation and reassembly procedures.
5. Describe the operation of a packet-switched network.
6. Explain the main threats and attacks on the security of telecommunication networks.
7. Classify telecommunications networks based on topology.
8. Describe the basic architecture of a circuit switching Center.
9. Explain the types of control associated with each circuit switching Center architecture.
10. Classify telecommunications networks based on switching techniques.
11. Describe the functionality of signaling networks.
12. Identify the elements of telecommunications networks.
13. Explain the need and the different types of signs.
14. Describe the services, security protocols and mechanisms used in telecommunication networks

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"Digital Telephony", J.C. Bellamy, Tercera edición, Ed. Willey-Interscience Publications John Willeyand sons, 2000

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

"Network security essentials: applications and standards", Stallings, W., Pearson Prentice Hall, 2007

Year 2015/16

Course Name:	Signals and Systems	**Course Code:**	595000116
Year:	2	**Semester:**	3
Credits (ECTS):	6	**Credit Hours:**	4
Area:	Mathematics	**Type:**	Basic / Required
Term:	Fall / Spring	**Language:**	Spanish
Prerequisites / Co-requisites:		Calculus I Lineal Algebra Calculus II Circuit Analysis II	
Coordinator:		Juan Carlos González de Sande	
Bachelor Engineering Program:		Sound and Image Engineering Communications Electronics Engineering Telecommunications Systems Engineering Telematics Engineering	

Course Contents

1. Introduction to the signals analysis in the time domain
2. Systems analysis of in the time domain
3. Fourier analysis for continuous-time systems and signals
4. Fourier analysis for discrete-time systems and signals

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 search and select information, develop critical thinking and produce and defend arguments within the area.

CG 03 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.

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 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 to solve engineering problems.

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.- Characterize and analyze mathematically in the time domain signals and of continuous time and discrete time LTI systems.

2.- Characterize and analyze signals and continuous time LTI systems, in the domino frequency and in the transformed domain.

3.- Characterize and analyze signals and discrete time LTI systems, in the domino frequency and in the transformed domain.

4.- Determination of the most suitable method to be applied in the analysis of basic problems with signals and systems.

5.- Analysis and characterization of discrete time signals.

6.- Performing basic operations with signals and functions.

7.- Perform the convolution of signals.

8.- Determine the relationship between the different ways of characterizing LTI systems.

9.- An analysis on frequency of continuous time signals.

10.- An analysis on frequency of discrete time signals.

11.- Characterize mathematically the operation of sampling of continuous-time signals.

12.- Calculate the ideally sampled signal spectrum.

13.- Characterize LTI discrete time systems in the time domain (impulse response and constant coefficients linear difference equation) and transformed domains (frequency response and stem function).

14.- Characterize LTI systems in continuous time in the frequency and in the Laplace domain.

15.- Represent the poles and zeros diagram of the continuous-time and discrete time systems.

16.- Characterize different types of systems depending on their frequency discrimination.

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"Señales y Sistemas: análisis mediante métodos de transformada y MATLAB" M.J. Roberts, McGraw-Hill Interamericana. 2005.