

SOUND AND IMAGE ENGINEERING

B. Eng.

ELECTIVE COURSES TYPE A

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Year 2015/16

Course Name:	Audio Engineering III	Course Code:	595010141
Year:	3	Semester:	6
Credits (ECTS):	4,5	Credit Hours:	3
Area:	Elective	Type:	Elective / Type A
Term:	Spring	Language:	Spanish
Prerequisites / Co-requisites:	Sound and Image Fundamentals Audio Engineering I Audio Engineering II		
Coordinator:	Francisco Javier Taberero Gil		
Bachelor Engineering Program:	Sound and Image Engineering		

Course Contents

1. Specific Aspects of Audio Installations
2. Cables and Connectors
3. Electricity Grid Network Aspects
4. Audio Equipment Interconnection
5. Auxiliary Audio Equipment
6. Examples of Installations and Associated Elements

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
- (e) An ability to identify, formulate, and solve engineering problems
- (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 SI01 Ability to build, utilize and manage telecommunication services and applications for the purpose of acquiring, treating analogically and digitally, encoding, transporting, representing, processing, storing, reproducing, managing and presenting audiovisual services and multimedia information.
- CE SI02 Ability to analyze, specify, implement and support television, audio and video systems, equipment, headers and facilities, both in fixed and mobile environments.

CE SI03 Ability to carry out projects for studios and facilities which will be used for audio and video signal production and recording.

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

- 1.- Comprehend and analyze the characteristics of different equipment used in audio engineering for a concrete use.
- 2.- Analyze the characteristics of the different working environments in audio installations.

Bibliography

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Year 2015/16

Course Name:	Advanced Signal Processing	Course Code:	595010142
Year:	3	Semester:	6
Credits (ECTS):	4,5	Credit Hours:	3
Area:	Elective	Type:	Elective / Type A
Term:	Spring	Language:	Spanish
Prerequisites / Co-requisites:	Audio Engineering I Digital Signal Processing Signals and Systems		
Coordinator:	Antonio Mínguez Olivares		
Bachelor Engineering Program:	Sound and Image Engineering		

Course Contents

1. Adaptive Systems
2. Audio Effects Algorithms
3. Transmission Systems in Underwater Acoustics
4. Musical Signal Analysis and Synthesis
5. Pattern Detection

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
- (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 SI01 Ability to build, utilize and manage telecommunication services and applications for the purpose of acquiring, treating analogically and digitally, encoding, transporting, representing, processing, storing, reproducing, managing and presenting audiovisual services and multimedia information.
- 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.

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.- Manipulate the spectrum (spectral compression-expansion) by interpolating or decimating the numerical sequences.
- 2.- Designing algorithms that perform some kind of effect on the audio signal: reverberation, equalization, dynamic range compression-expansion, time scale adjustment, setting the tone, etc.
- 3.- Apply sorting techniques to sound and image patterns recognition. Study the biometric applications that are handled biometric features, such as: fingerprint, iris, face and voice.
- 4.- Understand the general concepts and techniques of classification of patterns.
- 5.- Establish a discreet propagation medium model for acoustic waves in the sea, for the calculation of paths and the determination of acoustic transmission channels.
- 6.- Recognize the number sequences basic carriers of any information.
- 7.- Learn the techniques of musical signals analysis and synthesis.
- 8.- Design adaptive systems and apply to practical situations as active control of acoustic noise.
- 9.- Discern between FIR and IIR algorithms (advantages, disadvantages).
- 10.- Manage the time-frequency duality of the numerical sequences and discrete systems domain. Know the relationships between the two domains.
- 11.- Learn about active and passive underwater acoustic transmission systems.
- 12.- Modify the spectrum of sequences, through digital filters, to remove any information or to enhance it or attenuate it.
- 13.- Represent discrete, linear and invariant, systems through differences equations and recognize its own characteristics.

Bibliography

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Year 2015/16

Course Name:	Noise and Vibration Control	Course Code:	595010143
Year:	4	Semester:	7
Credits (ECTS):	4,5	Credit Hours:	3
Area:	Elective	Type:	Elective / Type A
Term:	Fall	Language:	Spanish
Prerequisites / Co-requisites:	Room Acoustics Sound and Image Fundamentals Acoustic Engineering		
Coordinator:	Constantino Gil González		
Bachelor Engineering Program:	Sound and Image Engineering		

Course Contents

1. Noise Effects
2. Systematic Approach to Noise Control
3. Noise Generators
4. Aerodynamic Noise
5. Noise produced by vibrating structures
6. Vibration Control
7. Impact Noise Isolation
8. Noise Legislation

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
- (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 09 Ability to analyze and assess the social and environmental impact of technical

solutions.

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.- Know the parameters that assess the sources of noise and vibration.
- 2.- Know the behavior of the structures against vibrations.
- 3.- Know how aerodynamic noise is produced, spreaded and controlled.
- 4.- Know how the specific legislation on noise is structured, developed and applied
- 5.- Learn about the physical phenomena that give rise to the appearance of noise sources.
- 6.- Know the physical behaviour of noise sources, considered individually and in group.
- 7.- Assess specific effects of noise and vibration on people.
- 8.- Know how the noise generated by vibrating structures is produced, spreaded and controlled.
- 9.- Know how structure-borne noise is produced, transmitted and controlled.

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Gil, C., Control de Ruido, Dpto. Publicaciones de la E.T.S. de Ingeniería y Sistemas de Telecomunicación, Madrid, 2002

Beranek, L. L. y Ver, I. L., Noise and Vibration Control Engineering: Principles and Applications, New York, McGraw Hill, 1992

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Dowling, A. P. y Flowcs Williams, J. E., Sound and Sources of Sound, Jhon Wiley & Sons, Inc, England, 1983

Wilson, C. E., Noise Control, Harper & Row, Publishers Ltd, New York, 1989

Year 2015/16

Course Name:	Audio Engineering IV	Course Code:	595010144
Year:	4	Semester:	7
Credits (ECTS):	4,5	Credit Hours:	3
Area:	Elective	Type:	Elective / Type A
Term:	Fall	Language:	Spanish
Prerequisites / Co-requisites:	Sound and Image Fundamentals Audio Engineering I Audio Engineering II		
Coordinator:	Jorge Grundman Isla		
Bachelor Engineering Program:	Sound and Image Engineering		

Course Contents

1. Musical Timing
2. Audio Restoring
3. Sonority Measurement in Audio
4. Digital Multitrack Editing in Audio
5. Audio Signal Mixing
6. Audio Mastering

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
- (e) An ability to identify, formulate, and solve engineering problems
- (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 B2 Basic knowledge on using and programming computers, operating systems, databases and software used in engineering.
- CE SI01 Ability to build, utilize and manage telecommunication services and applications for the purpose of acquiring, treating analogically and digitally, encoding,

transporting, representing, processing, storing, reproducing, managing and presenting audiovisual services and multimedia information.

- CE SI02 Ability to analyze, specify, implement and support television, audio and video systems, equipment, headers and facilities, both in fixed and mobile environments.
- CE SI03 Ability to carry out projects for studios and facilities which will be used for audio and video signal production and recording.
- CE SI05 Ability to create, encode, manage, broadcast and distribute multimedia content, taking into account usability and accessibility criteria for audiovisual, broadcast and interactive services.
- CE TEL08 Ability to apply analysis and treatment of signals and modeling system tools
- CE TEL16 Knowledge of telecommunication legislation and regulations at the National, European and International levels.
- CG 04 Ability to abstract, analyze, and synthesize, and to solve problems.
- CG 12 Skills for interpersonal relations and work in a national and international context, with the ability to express in oral and written English.

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

- 1.- Each and every one of the learning outcomes are totally linked in direct and essential way with the specific content that is imparted in the subject, being, essential that the generic competences are settled efficiently since your domain will improve teacher-student communication and, no doubt, will contribute to the better use of the subject. Since each of the learning outcomes are associated with specific competencies, each and every one of the specific contents of the subject become, in turn, indicators of achievement that will be subject to the criteria of evaluation of equal form and relevance.

Bibliography

Alten, Stanely R. Audio in Media. Thomson Publishing

Katz, Bob. Mastering Audio. Focal Press, 2002

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Year 2015/16

Course Name:	Image Synthesis and Computer Animation	Course Code:	595010145
Year:	4	Semester:	7
Credits (ECTS):	4,5	Credit Hours:	3
Area:	Elective	Type:	Elective / Type A
Term:	Fall	Language:	Spanish
Prerequisites / Co-requisites:		Sound and Image Fundamentals Image and Video Technologies	
Coordinator:		Enrique Rendón Angulo	
Bachelor Engineering Program:		Sound and Image Engineering	

Course Contents

1. Introduction
2. Modelling
3. Cameras and Illumination
4. Texturing and Environment
5. Animation
6. Interactivity and Sound
7. Complexity, quality and efficiency

ABET Student Outcomes

- (a) An ability to apply knowledge of mathematics, science, and engineering
- (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
- (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 SI01 Ability to build, utilize and manage telecommunication services and applications for the purpose of acquiring, treating analogically and digitally, encoding, transporting, representing, processing, storing, reproducing, managing and presenting audiovisual services and multimedia information.
- CE SI05 Ability to create, encode, manage, broadcast and distribute multimedia content, taking into account usability and accessibility criteria for audiovisual, broadcast and interactive services.

- CG 07 Ability to design, manage, and direct projects.
- CG 08 Ability to organize, plan and make decisions.
- CG 11 Skills for the use of Information and Communication Technologies.

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

- 1.- Generate interactive 3D applications with synchronized audio.
- 2.- Generate 3D models with controlled appearance, animation and interactive behavior.
- 3.- Generate 3D environments by integrating the created models and controlling lighting, cameras, and other elements of environment.
- 4.- Generate 3D synthetic video with audio and composition with real video.

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Tony Mullen. "Animación de personajes con Blender (Diseño y creatividad)", Anaya Multimedia, 2007.

Joaquin Riezu Gonzalez. "Entendiendo el Game Engine de Blender", Junio 2011.

Sandra Moreno de Andrés. "Blender: Modelado y Animación para Aplicaciones Interactivas", Mayo 2012

Year 2015/16

Course Name:	Sound Reinforcement	Course Code:	595010146
Year:	4	Semester:	8
Credits (ECTS):	4,5	Credit Hours:	3
Area:	Elective	Type:	Elective / Type A
Term:	Spring	Language:	Spanish
Prerequisites / Co-requisites:	Room Acoustics Sound and Image Fundamentals Acoustic Engineering Electroacoustic Systems		
Coordinator:	Juan Jose Gómez Alfageme		
Bachelor Engineering Program:	Sound and Image Engineering		

Course Contents

1. Multichannel Sound in Cinema
2. Sound Reinforcement in large facilities

ABET Student Outcomes

- (a) An ability to apply knowledge of mathematics, science, and engineering
- (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
- (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 SI03 Ability to carry out projects for studios and facilities which will be used for audio and video signal production and recording.
- CE SI04 Ability to carry out acoustic engineering projects on: acoustic isolation and acoustic conditioning, PA installations; specification, analysis and selection of electroacoustic transducers; measurement, analysis and noise and vibration control systems; environmental acoustics; underwater acoustics systems.

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

- 1.- Know the current multichannel cinema sound systems specifications and future trends.
- 2.- Understand and design electroacoustic systems mounted in movie theaters.
- 3.- Designing and sizing an electroacoustic system for a movie theatre.

- 4.- Use simulation tools for the design of electroacoustic systems in movie theaters.
- 5.- Meet sound emission systems used in large installations.
- 6.- Propose equipment and diagrams of wiring systems of sound in movie theaters.
- 7.- Learn to interpret the technical characteristics of the electroacoustic systems mounted in theaters.
- 8.- Calculate the amplification of a multiple speaker system.
- 9.- Know and apply the techniques of grouping of sources used in large installations, clusters, and linear arrays of loudspeakers.
- 10.- Predicting the radiation and coverage of groups of speakers using professional tools.

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Davis D, Davis C., Sound System Engineering, Howard W. Sams & Sons, Indianapolis, 1989.

Eargle J., Handbook of Sound System Design, ELAR Publishing Company Inc., New York, 1989.

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Year 2015/16

Course Name:	Digital Image Processing	Course Code:	595010147
Year:	4	Semester:	8
Credits (ECTS):	4,5	Credit Hours:	3
Area:	Elective	Type:	Elective / Type A
Term:	Spring	Language:	Spanish
Prerequisites / Co-requisites:	Sound and Image Fundamentals Digital Signal Processing Image and Video Technologies		
Coordinator:	Jose Manuel Díaz López		
Bachelor Engineering Program:	Sound and Image Engineering		

Course Contents

1. Introduction to Digital Image Processing
2. Elements of Visual Perception and models to express chromatic images
3. Two-dimensional Sampling and Quantification
4. Statistic Valuation of Images
5. Image Transforms
6. Image Enhancement
7. Image Filtering
8. Image Analysis. Artificial Vision.
9. Image Restoring

ABET Student Outcomes

- (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
- (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 SI05 Ability to create, encode, manage, broadcast and distribute multimedia content, taking into account usability and accessibility criteria for audiovisual, broadcast and interactive services.

- CE ST06 Ability to analyze, to codify, to process and to transmit multimedia information using processed techniques of analog and digital signal.
- CG 02 Ability to search and select information, develop critical thinking and produce and defend arguments within the area.
- CG 11 Skills for the use of Information and Communication Technologies.

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

- 1.- Identify and recognize the technical specifications of image capture devices.
- 2.- Recognize the basic features of a system of digital image processing.
- 3.- Understand the methods of extracting information from an image and if its reused by artificial vision systems.
- 4.- Select from technical specifications which image capture device is most suitable for a specific use.
- 5.- Knowing the process of restoration of images whose purpose is the estimation of the original image from the degraded image.
- 6.- Describe the process of digitization of the image.
- 7.- Carry out operations of accentuation of certain characteristics of the image according to its future implementation.
- 8.- Describe the scheme of connection of an image processing system.

Bibliography

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