



**ESCUELA SUPERIOR POLITÉCNICA DEL LITORAL**  
**Faculty of Electrical and Computer Engineering**  
**COURSE SYLLABUS**  
*Audio and Video Processing*

**1. CODE AND NUMBER OF CREDITS**

<b>CODE</b>	FIEC05413
<b>NUMBER OF CREDITS: 4</b>	<b>Theoretical: 4</b> <b>Practical: 0</b>

**2. COURSE DESCRIPTION**

The course Audio and Video Processing provides knowledge about the theoretical and practical tools to capture, process, edit and produce audio and video clips through a computer. In this course, special emphasis is given to the study of digital audio and video, although their analog counterparts are reviewed to provide the basic knowledge needed. An important part of the course deals with the programming of digital filters for different effects both in audio and video.

**3. PRE-REQUISITES AND CO-REQUISITES**

<b>PRE-REQUISITES</b>	FIEC04382 SIGNALS AND SYSTEMS
<b>CO-REQUISITES</b>	

**4. CORE TEXT AND OTHER REQUIRED REFERENCES FOR THE TEACHING OF THE COURSE**

<b>CORE TEXT</b>	1. Burger, Jeff. DESKTOP MULTIMEDIA BIBLE. Addison-Wesley, 0-201-58112-4
<b>REFERENCES</b>	1. Smith, Steven. The Scientist and Engineer's Guide to Digital Signal Processing 2. Woods, John. Multidimensional Signal, Image, and Video Processing and Coding, Second Edition 3. Z. Izer, Udo. Digital Audio Signal Processing

**5. COURSE LEARNING OUTCOMES**

At the end of the course, the student will be able to:

1. Know the physical phenomena related to audio and video signals.
2. Know the concepts related to the perception that allow proper capture, digitization and quantization of audio and video signals.
3. Design and implement algorithms for filtering audio and video signals.
4. Produce high quality digital audio clips and / or videos by knowing the physical phenomena, electronic equipment, computer algorithms and specialized software for this type of signals.

**6. COURSE PROGRAM** *(The general subjects to be covered in the course (chapters) must be listed, and then for each subject the details of the topics to be covered indicating the number of hours per chapter.)*

**I. FUNDAMENTALS OF ACOUSTICS.** (2 sessions - 3 hours).

- Introduction.
- Frequencies and tone.
- Harmonics.
- Amplitude and volume.
- Moments of sound
- Reflection.
- Attenuation and amplification.
- Absorption.
- Resonance.
- Interference.

**II. PSYCHOACOUSTIC.** (1 session - 1 hour).

- Ear function.
- Ear capabilities.
- Perception of amplitude.
- Perception of frequency.
- Masking.

**III. ANALOG AUDIO.** (2 sessions - 4 hours).

- Audio as electrical impulses.
- Audio Levels (audio chain).
- Fidelity.



	<ul style="list-style-type: none"> <li>• Audio hardware</li> </ul>
<b>IV.</b>	DIGITAL AUDIO. (5 sessions - 10 hours).
	<ul style="list-style-type: none"> <li>• Why digital?</li> <li>• Digitization.</li> <li>• Compression.</li> <li>• Storage.</li> <li>• Transmission.</li> </ul>
<b>V.</b>	DIGITAL AUDIO PROCESSING. (2 sessions - 4 hours).
	<ul style="list-style-type: none"> <li>• Filters for Audio</li> <li>• Amplitude effects.</li> <li>• Time effects.</li> <li>• Frequency effects.</li> <li>• Noise reduction.</li> <li>• Compression / expansion and pitch-time.</li> <li>• Plugins programming.</li> </ul>
<b>VI.</b>	DIGITAL PRODUCTION. (2 sessions - 6 hours).
	<ul style="list-style-type: none"> <li>• The Audio in multimedia.</li> <li>• Production environment.</li> <li>• Production.</li> <li>• Recording.</li> <li>• Mixed.</li> <li>• Mastered.</li> </ul>
<b>VII.</b>	VIDEO BASICS. (1 session - 6 hours).
	<ul style="list-style-type: none"> <li>• What is video?</li> <li>• History of video.</li> <li>• Television.</li> </ul>
<b>VIII.</b>	ANALOG VIDEO. (2 sessions - 4 hours).
	<ul style="list-style-type: none"> <li>• Analog video formats.</li> <li>• Analog equipment.</li> </ul>
<b>IX.</b>	DIGITAL VIDEO. (3 sessions - 6 hours).
	<ul style="list-style-type: none"> <li>• Digital video formats.</li> <li>• Characteristics of digital video.</li> <li>• Digitizing video.</li> <li>• De-interlaced.</li> <li>• Sizes.</li> <li>• Change frame rate.</li> <li>• Compression.</li> </ul>
<b>X.</b>	DIGITAL VIDEO PROCESSING. (3 sessions - 6 hours).
	<ul style="list-style-type: none"> <li>• Digital image processing.</li> <li>• Video effects.</li> </ul>
<b>XI.</b>	DIGITAL VIDEO PRODUCTION. (2 sessions - 6 hours).
	<ul style="list-style-type: none"> <li>• Pre-production.</li> <li>• Filming.</li> <li>• Postproduction and editing.</li> </ul>

## 7. WORKLOAD: THEORY/PRACTICE

Twice a week, each session of 2 hours.

## 8. CONTRIBUTION OF THE COURSE TO THE EDUCATION OF THE STUDENT

This course contributes as follows:

- It allows the student to study a current topic of computer science such as the use of a computer to process audio signals and digital video.
- Students are exposed to languages and alternative computational tools specifically designed to work with audio and digital video.
- Students should, through the revised theory, analyze and solve problems arising in capture environments, processing, editing and production of audio and digital video.

BASIC TRAINING	PROFESSIONAL TRAINING	SOCIAL SKILLS DEVELOPMENT
	X	



**9. THE RELATIONSHIP BETWEEN THE LEARNING OUTCOMES OF THE COURSE AND THE LEARNING OUTCOMES OF THE DEGREE PROGRAM**

LEARNING OUTCOMES OF THE DEGREE PROGRAM*	CONTRIBUTIO N (High, Medium, Low)	LEARNING OUTCOMES OF THE COURSE**	THE STUDENT MUST:
a) Ability to apply computing and mathematical knowledge appropriate to their discipline	High	1,2	Apply concepts of digitization, Fourier Transform, Convolution and Digital Filters
b) Ability to analyze a problem, identify and define the appropriate computational requirements for its solution	High	2,3	Analyze problems related to audio and video digital processing. Identify potential algorithms and filters to solve the problem analyzed Define the necessary criteria to determine if the solution can work in real time or not
c) Ability to design, implement, and evaluate a computer-based system, processes, components and programs that meet specific needs	Medium	3,4	Program components that can be used in the development of Multimedia Systems
d) Ability to function effectively in teams to achieve a common goal	Low	4	Being part of a team of audio and video production
e) Comprehension of professional, ethic, legal security and social responsibilities of their profession	Low	4	Select most appropriate licensing for your audio and video products
f) Ability to communicate effectively with a range of audiences			
g) Ability to analyze the local and global impact of computing on individuals, organizations and society			
h) Acknowledge the need for and ability to engage in continuous professional development			
i) Ability to use techniques, skills, and current tools necessary for the practice of computing	High	4	Use the most current algorithms, programming languages and tools for digital audio and video processing
j) Capacity to lead, manage or undertake projects			

**10. EVALUATION IN THE COURSE**

Evaluation activities	
Exams	X
Tests	X
Homework/tasks	X
Projects	X
Laboratory/Experiments	
Class participation	
Visits	
Other	

**11. PERSON RESPONSIBLE FOR THE CREATION OF THE SYLLABUS AND THE DATE OF ITS CREATION**

<b>Created by</b>	Gonzalo Luzardo, M.Sc.
<b>Date</b>	May/3/2013



## 12. APPROVAL

ACADEMIC SECRETARY OF THE ACADEMIC DEPARTMENT	DIRECTOR OF TECHNICAL ACADEMIC SECRETARY
NAME: Sra. Leonor Caicedo G.	NAME: Ing. Marcos Mendoza V.
SIGNATURE: 	SIGNATURE: 
Date of approval by the Directive Council: 2013-334 2013-08-12	<b>Ing. Marcos Mendoza V.</b> DIRECTOR DE LA SECRETARIA TÉCNICA ACADÉMICA

## 13. VALIDITY OF THE SYLLABUS

RESOLUTION OF THE POLYTECHNIC BOARD:	13-10-269
DATE:	2013-10-17