Hybrid Professional Master's Degree
Acoustic Engineering

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Acoustic Engineering

Modality: **Hybrid (Online + Internship)**
Duration: **12 months**
Certificate: **TECH Global University**
Accreditation: **60 + 4 ECTS**
Website: **www.techtitute.com/us/engineering/hybrid-professional-master-degree/hybrid-professional-master-degree-acoustic-engineering**

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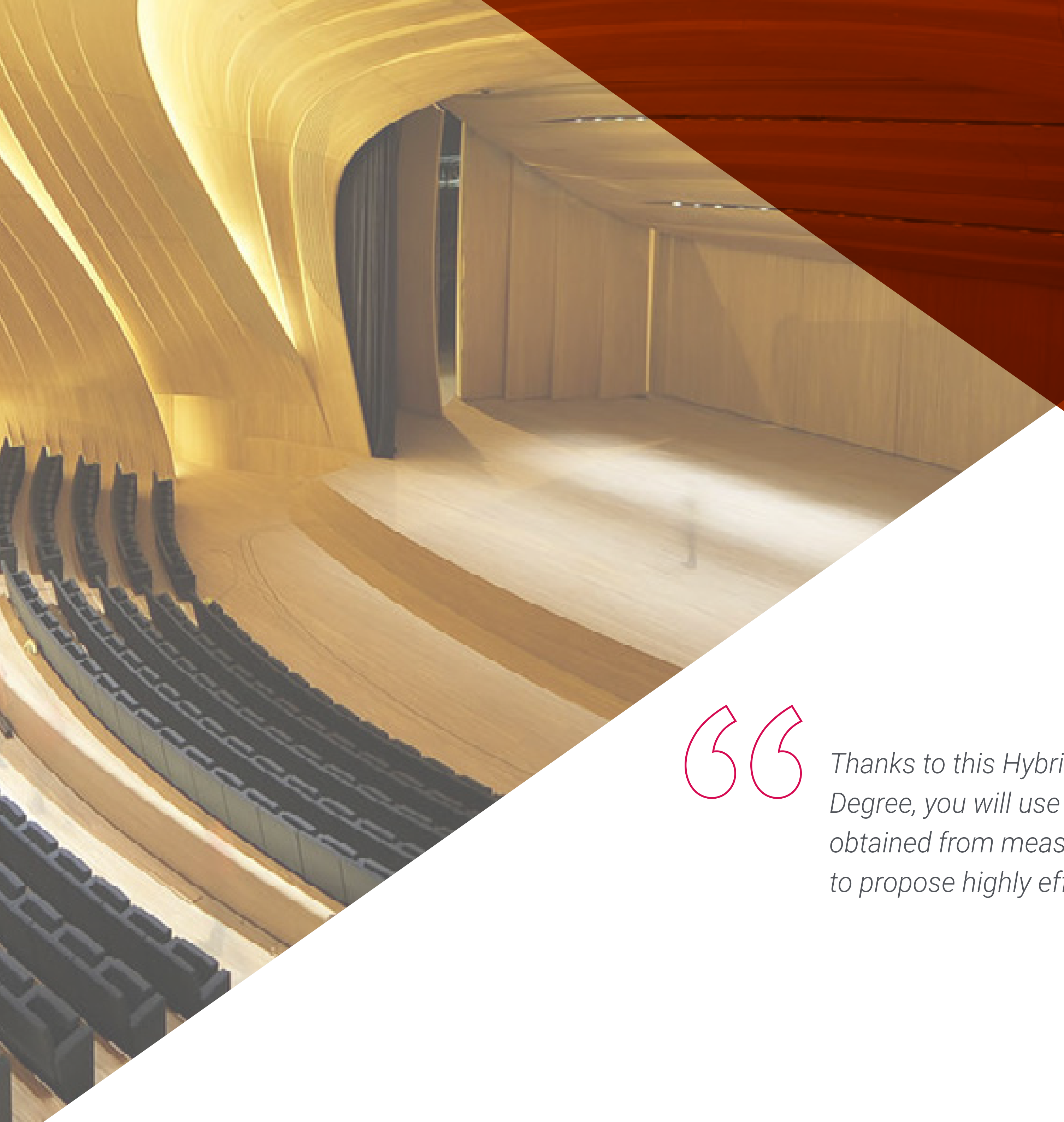
01

Introduction

Acoustic Engineering plays a crucial role in improving the quality of life in increasingly noisy urban environments. Therefore, more and more companies are demanding the incorporation of engineers specialized in this field who are able to optimize the quality of the acoustic environment. Faced with these opportunities, professionals need to incorporate into their daily practice emerging technologies to mitigate urban noise and propose innovative solutions that capture the interest of companies. In this context, TECH presents a revolutionary university degree that delves into the most advanced acoustic modeling and simulation techniques. In this way, graduates will develop skills that will allow them to experience a significant leap in quality in their careers as engineers.



Thanks to this Hybrid Professional Master's Degree, you will use the acoustic data obtained from measurements and simulations to propose highly effective solutions"

Urban growth and industrial expansion have intensified the challenges related to environmental noise and acoustic quality in modern cities. Faced with this, Acoustic Engineering emerges as an essential discipline to mitigate these problems, through the development of innovative and sustainable strategies. In this sense, professionals must be equipped with both the knowledge and skills necessary to overcome the challenges in this ever-expanding field.

To facilitate this task, TECH launches a pioneering Hybrid Professional Master's Degree in Acoustic Engineering with a theoretical-practical approach, which ensures that specialists obtain advanced skills to optimize their job performance. Designed by experts in this field, the academic itinerary is composed of 10 specialized modules that will delve into the most recent innovations in fields such as room acoustics, acoustic insulation, acoustic signal detection or pumping stations. In addition, during the course of the program, graduates will develop advanced skills in the use of advanced acoustic measurement and analysis equipment and techniques. In tune with this, experts will be able to design effective solutions to control noise and improve acoustic quality in various environments (such as buildings, industries, public spaces, etc.).

The methodology of this university program consists of two phases. The first stage is theoretical and is conducted in a completely online format that facilitates progressive and natural learning through TECH's innovative Relearning system. This approach eliminates the need for traditional memorization and allows for a more fluid learning process. Subsequently, the program includes a 3-week internship at a leading acoustic engineering institution. This experience provides graduates with the opportunity to apply the knowledge acquired in a real working environment, collaborating with an experienced team of professionals in the field.

This **Hybrid Professional Master's Degree in Acoustic Engineering** contains the most complete and up-to-date scientific program on the market. The most important features include:

- Development of more than 100 case studies presented by experts in Acoustic Engineering
- Its graphic, schematic and practical contents provide essential information on those disciplines that are indispensable for professional practice
- Practical exercises where the self-assessment process can be carried out to improve learning
- Its special emphasis on innovative methodologies
- All of this will be complemented by theoretical lessons, questions to the expert, debate forums on controversial topics, and individual reflection assignments
- Content that is accessible from any fixed or portable device with an Internet connection
- Furthermore, you will be able to carry out an internship in one of the best companies

Do you want to incorporate the most innovative techniques for evaluating sound pressure levels into your practice? Achieve it with this complete university degree"

Enjoy an intensive 3-week stay in a reputable center and get up to date on the latest procedures to achieve personally and professional growth"

You will gain valuable lessons learned through real-world case studies in simulated learning environments.

You will have a comprehensive knowledge of international regulations and standards related to noise control.

In this Hybrid Professional Master's Degree proposal, of a professionalizing nature and blended mode, the program is aimed at updating Acoustic Engineering professionals. The contents are based on the latest scientific evidence, and oriented in a didactic way to integrate theoretical knowledge into practice, and the theoretical-practical elements will facilitate the updating of knowledge.

Thanks to its multimedia content elaborated with the latest educational technology, it will allow the engineering professional a situated and contextual learning, that is to say, a simulated environment that will provide an immersive learning programmed to train in real situations. This program is designed around Problem-Based Learning, whereby the physician must try to solve the different professional practice situations that arise during the course. For this purpose, the students will be assisted by an innovative interactive video system created by renowned and experienced experts.

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Why Study this Hybrid Professional Master's Degree?

With the advent of the Fourth Industrial Revolution, the field of Acoustic Engineering has been enriched by the incorporation of technological tools that optimize the processes of analysis, noise mitigation and predictions. Given this situation, it is essential that professionals acquire the skills to get the most out of these instruments. For this reason, TECH has created this pioneering degree, which combines the most recent update in areas such as pumping stations, acoustic testing and acoustic insulation with a practical stay in a prestigious clinical center. In this way, the student will get a complete vision of the most current panorama in Acoustic Engineering, being guided throughout the process by real experts in the field.

You will acquire skills to perform accurate measurements of environmental and industrial noise using state-of-the-art equipment"

1. Updating from the latest technology available

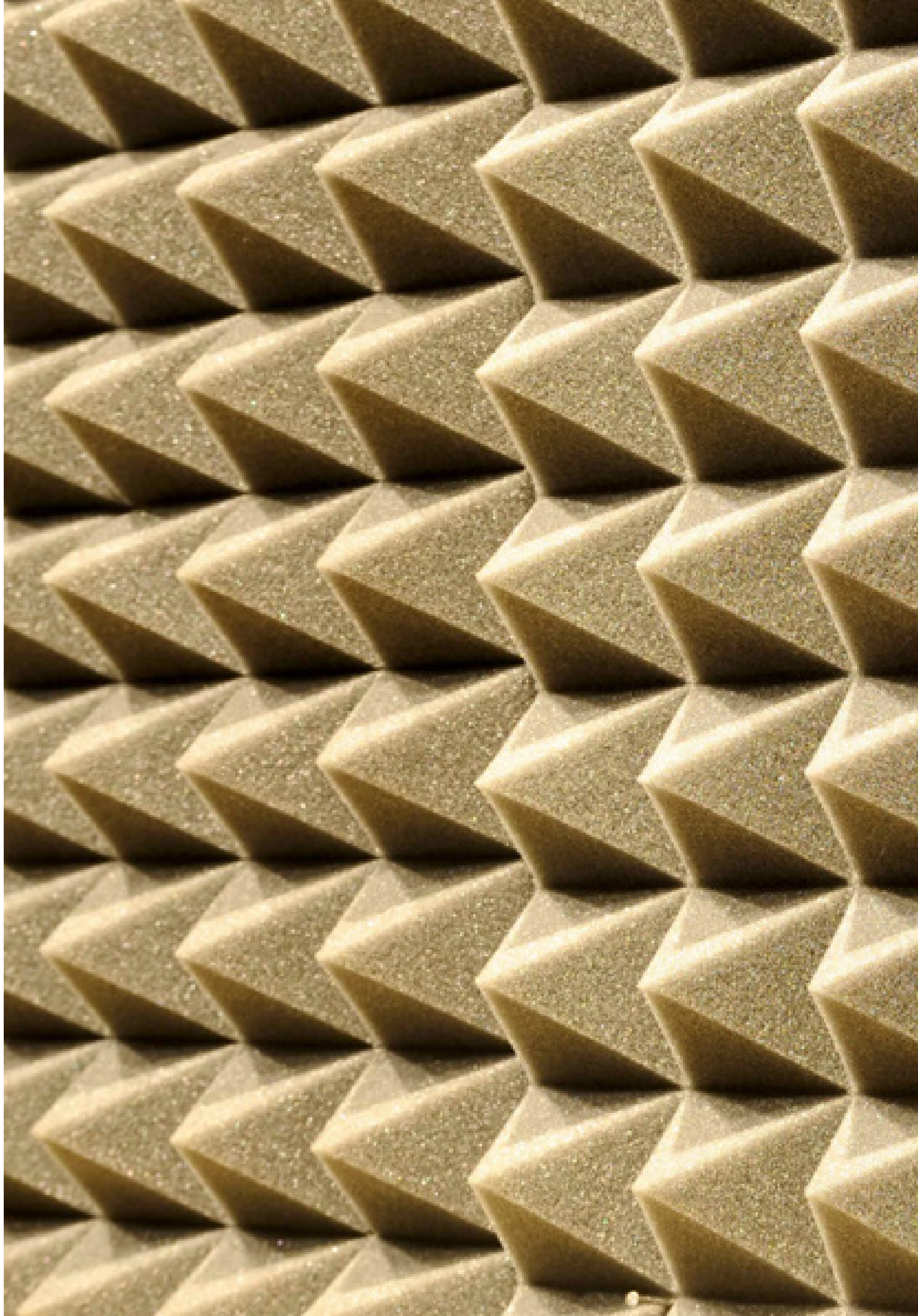
New technologies are significantly transforming the field of Acoustical Engineering, providing more advanced and accurate tools for noise analysis, prediction and mitigation. Through this university program, TECH will provide students with the most cutting-edge technological tools to perform their work comfortably.

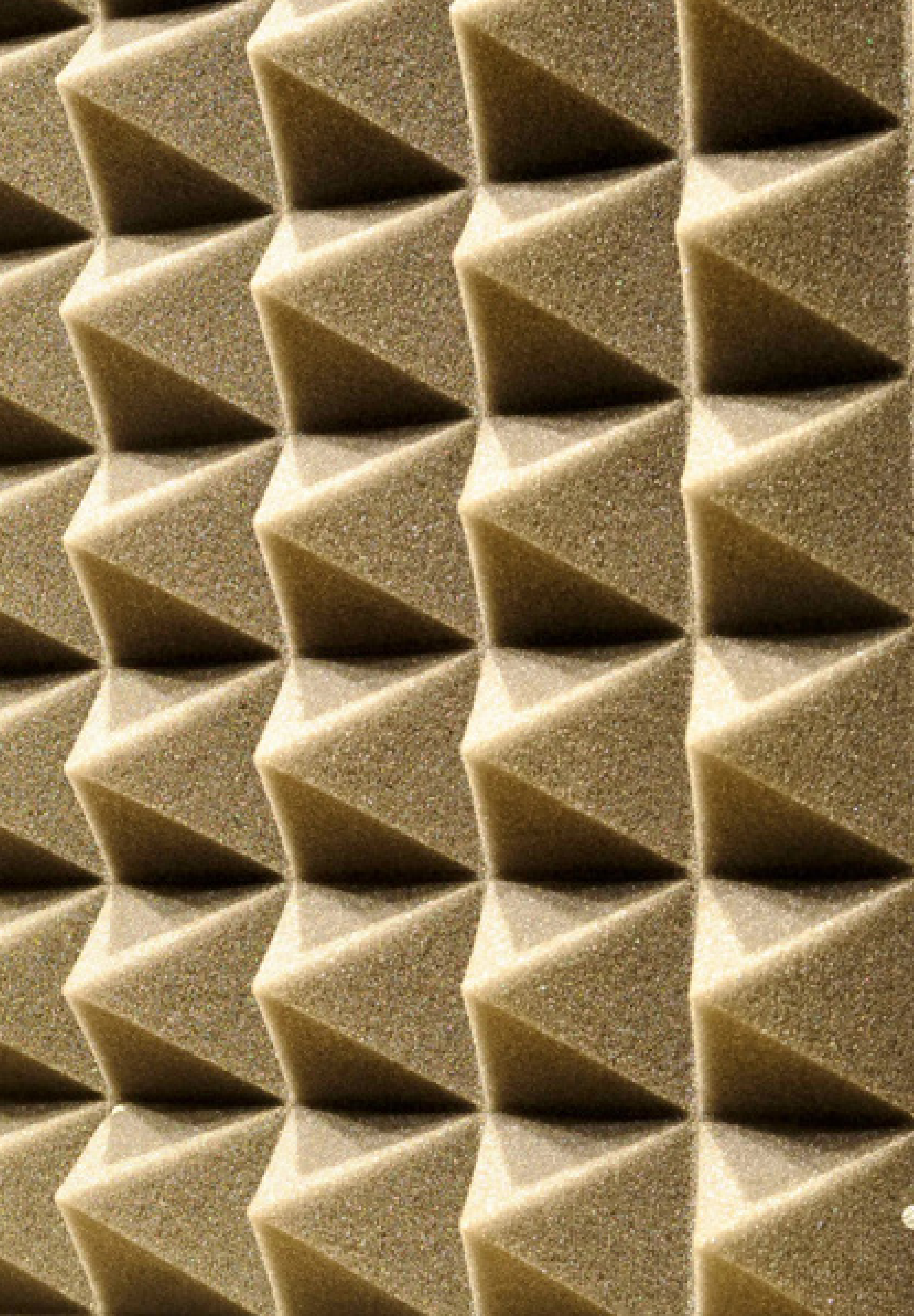
2. Gaining in-depth knowledge from the experience of top specialists

This Hybrid Professional Master's Degree has the collaboration of distinguished experts in Acoustic Engineering. During the first phase of the program, students will be supported by a teaching staff made up of renowned specialists in this field. Then, during the practical stay, the graduates will have the support of real professionals based in the institution that will host them for this type of program.

3. Entering first-class professional environments

In its philosophy of offering the most complete itineraries on the market, TECH carefully selects the institutions that will host its students during the 3-week practical training included in this degree. These companies have a high prestige, thanks to their staff and their high specialization in the field of Acoustic Engineering.





4. Combining the best theory with state-of-the-art practice

This program breaks with the schemes in the current pedagogical market, where university programs with little focus on didactic training prevail. Far from this, TECH presents a disruptive learning model, under a theoretical-practical approach that facilitates the access of engineering professionals to reference institutions.

5. Expanding the boundaries of knowledge

With this university program, TECH offers engineers the opportunity to expand their professional horizons from an international perspective. This is possible thanks to the wide range of contacts and collaborators available at TECH, the world's largest online university.

You will have full practical immersion at the center of your choice"

03
Objectives

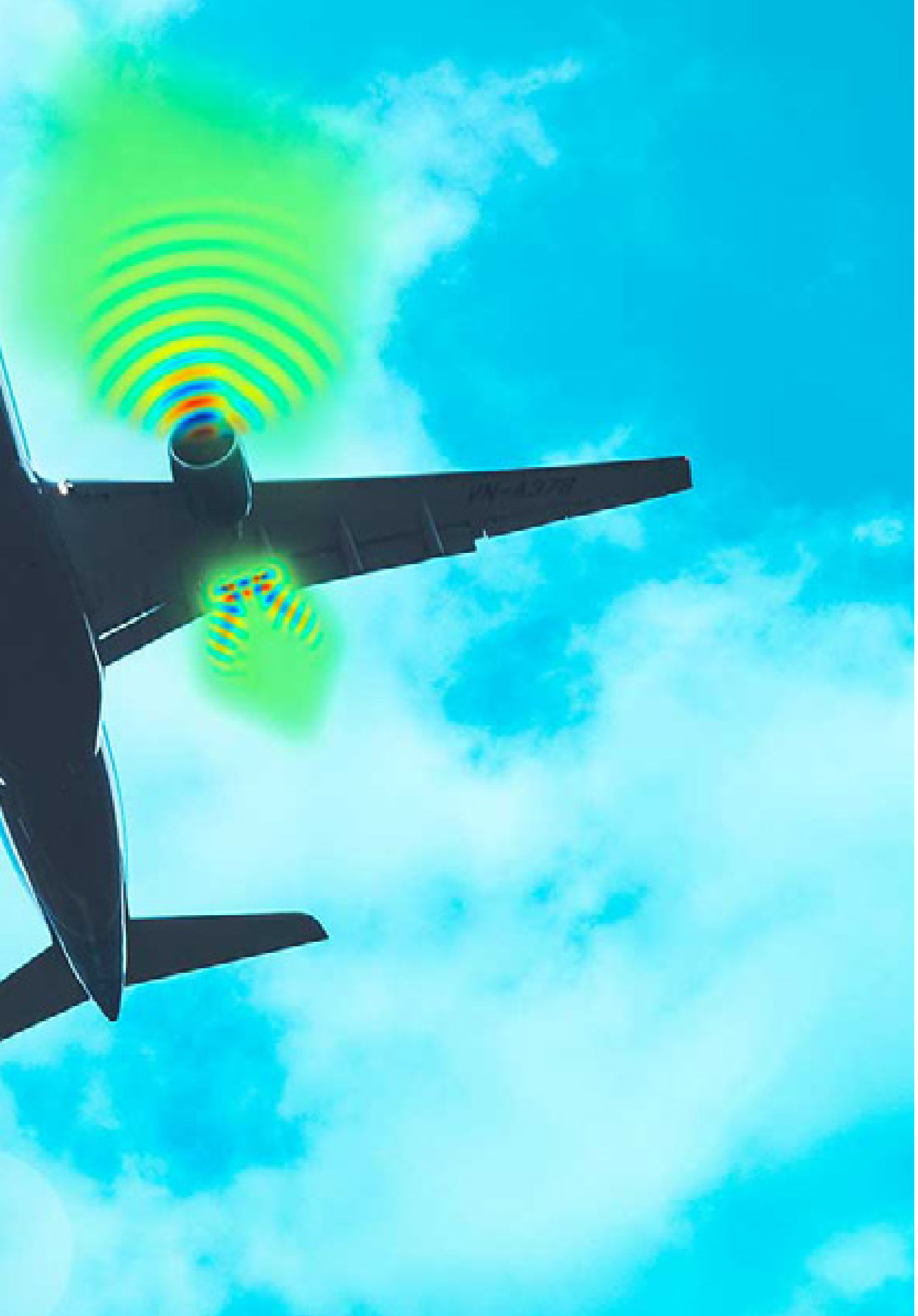
After completing this comprehensive Hybrid Professional Master's Degree, engineering professionals will acquire a holistic understanding of the theoretical and practical principles of acoustics. In this same line, graduates will have a high understanding of the phenomena of sound propagation, acoustic system design and measurement methods. In addition, they will gain advanced capabilities to use specialized modeling software. In this way, experts will predict and analyze the behavior of sound in different structures.

You will be able to design buildings that incorporate sustainability principles such as efficient energy use or eco-friendly building materials"

General Objective

- Through this Hybrid Professional Master's Degree in Acoustical Engineering, professionals will acquire competence to design acoustic insulation systems, noise control, and sound quality optimization in a variety of spaces. At the same time, graduates will incorporate into their practice the most sophisticated data analysis techniques to evaluate noise levels, vibrations and acoustic characteristics in different contexts

Thanks to TECH's revolutionary Relearning methodology, you will integrate all the knowledge in an optimal way to successfully achieve the results you are looking for"



Specific Objectives

Module 1. Acoustical Physics Engineering

- Specify concepts related to sound wave propagation such as resonances or the speed of sound in fluids
- Apply the principles of noise propagation outdoors and in architectural elements such as plates, membranes, pipes and cavities, etc.
- Establish the principles governing the production of noise from sources and the propagation of sound waves and vibrations common in buildings and the environment
- Analyze behaviors such as reflection, refraction, absorption, transmission, radiation and diffraction of sound

Module 2. Psychoacoustics and Acoustic Signal Detection

- Develop the concept of noise and the characteristics of sound propagation
- Specify how to add and subtract complex sounds and how to assess background noise
- Measure objective and subjective sounds with the appropriate units and correlate them with each other using isophonic curves
- Evaluate the effects of frequency and temporal masking and its effect on perception

Module 3. Advanced Acoustic Instrumentation
- Analyze the different noise descriptors and their measurement
- Evaluate the behavior of temporal and frequency weightings in measurement
- Apply with fluency the general regulations that define instrumentation and its measurements
- Establish the correct use of a spectrum analyzer to identify noise sources, determine the degree of transmission through a structure or evaluate an acoustic treatment

Module 4. Audio Signal Processing and Systems
- Develop the quantization and sampling process necessary for discrete data acquisition and acquisition errors such as jitter, aliasing or quantization error
- Synthesize the analog-to-digital conversion and the different problems associated with signal discretization, as well as the analysis of periodic functions in the complex field
- Interpret the behavior of filtering and the type of response obtained in measurements
  Use digital signal generation for acoustic excitation
- Evaluate the use of the Laplace transform and other mathematical analysis tools to obtain response curves in the complex frequency and phasor plane, as well as other statistical presentations of results for various acoustic parameters

Module 5. Electroacoustics and Audio Equipment
- Delve into the effects of power on power levels and sound intensity
- Analyze the construction of acoustic enclosures and direct and indirect radiation transducers
- Design specific crossover filters for system designs based on electroacoustic transducers or calculate the gain in dB of an amplification system
- Define the types of amplification, design acoustic monitors and acquire mastery over the various equipment used in recording, reproduction and manipulation of audio in professional studio environments, being able to evaluate parameters such as distortions or pressure levels

Module 6. Room Acoustics
- Delve into the typology of noise and its different treatments
- Analyze and evaluate the transmission noise of machinery and equipment of installations
- Adapt the insulation calculation models to the different noise typologies
- Calculate the acoustic reduction index of a wall or building element

Module 7. Acoustic Insulation

- Calculate the axial, tangential and oblique modes of a rectangular room and their influence on the Schroeder frequency
- Choose the dimensions of a room according to the various modal distribution criteria and calculate their optimization
- Be able to calculate the sound absorption, TR or critical distance of a room
- Calculate QRD or PRD diffusers, among others

Module 8. Acoustic Installations and Testing

- Evaluate the spectral adaptation term C and Ctr in acoustic reports and tests
- Distinguish the planning of various noise tests depending on whether they are airborne or structural transmission in various building elements or environments (facades, impact, etc.) for the choice of measurement equipment and test set-up
- Develop the measurement procedures of the TRs in various environments
- Define the contents and minimum requirements of acoustic studies and reports and evaluate the results obtained in the tests

Module 9. Recording Systems and Studio Recording Techniques

- Identify and effectively use recording equipment, cables, connectors, and other essential devices used in recording studios
- Develop specific miking and microphone positioning techniques to capture high-quality audio in a variety of situations, such as vocal, instrumental, and group recordings
- Manage the audio chain, from input signal to recording and monitoring, ensuring an efficient and high quality workflow
- Evaluate different audio interfaces for specific projects

Module 10. Environmental Acoustics and Action Plans

- Analyze environmental noise indicators Lden and Ldn and define environmental noise measurement standards, protocols and procedures
- Develop other indicators such as traffic noise indicators TNI or SEL sound exposure
- Establish the measurement of traffic, railroad, aircraft or activity noise
- Design noise barriers, noise mapping or sound exposure limitation techniques for humans

04
Skills

Thanks to this university degree, engineers will acquire the skills to use specialized acoustic modeling and simulation software. In this way, experts will be able to predict and analyze the behavior of sound in different environments and structures. Likewise, professionals will be qualified to build acoustic insulation systems that optimize sound quality in both architectural and engineering spaces.

You will design acoustic insulation systems, noise control and sound quality optimization in architectural spaces"

General Skills

- Establish the various criteria or appropriate weightings to be applied in a given acoustic measurement
- Develop appropriate filtering techniques for acoustic data obtained in a measurement and manage software signal processing systems
- Apply criteria of qualitative and quantitative acceptability of a noise
- Evaluate the impact of different acoustic transducers or audio systems on a complex electro-acoustic system
- Adapt the design of public address systems to the special conditions of their outdoor or indoor environment by controlling their propagation characteristics and efficiency rules
- Apply recording techniques and use recording systems effectively in a variety of acoustical engineering and audio production contexts
- Evaluate the potential health effects of exposure to noise and vibration depending on the nature and level of the source
- Develop noise action and control plans based on noise type analysis

Specific Skills

- Develop skills for the research of new transducers and electronic audio equipment
- Design sound insulation for the building and civil engineering sectors
- Solve acoustic problems of lack of acoustic insulation
- Analyze the main constructive solutions to solve acoustic insulation problems
- Evaluate the impact of an acoustic solution based on the acoustic insulation parameters used in building and industry
- Plan and develop acoustic tests according to the acoustic phenomenon
- Develop the noise control, its limitation and measurement
- Analyze by testing the different acoustic measurement quantities and identify the type of test according to the acoustic measurement to be assessed
- Plan and develop the different types of tests according to international standards
- Evaluate the results obtained from the measurements made in order to prepare acoustic reports

05

Course Management

For the design and delivery of this Hybrid Professional Master's Degree, TECH has enlisted the services of the most outstanding professionals in the field of Acoustic Engineering. These experts have a broad professional background, which has allowed them to work in recognized organizations. Thanks to this, they have created top-quality teaching materials in line with the requirements of the labor market. In this way, engineers will have access to an immersive experience that will significantly raise their professional horizons.

You will have the support of authentic references in the field of Acoustic Engineering"

International Guest Director

Recognized for his contribution in the field of **Audio Signal Processing**, Shailesh Sakri is a renowned **engineer** specialized in the field of **Information Technology** and **Product Management**. With over two decades of experience in the technology industry, he has focused on implementing innovative solutions and process optimization at global institutions such as **Harman International** India.

Among his main achievements, he has filed multiple patents in areas such as **Directional Audio Capture** and **Directional Suppression with Omnidirectional Microphones**. For example, he has developed multiple methods to improve the performance of sound pickup and stereo separation with spherical pickup microphones. In this way, he has contributed to optimizing audio quality in electronic devices such as *smartphones* and thereby improving end-user satisfaction. He has also led projects that integrate hardware and software in audio systems, which has allowed consumers to enjoy a more immersive sound experience.

On the other hand, he has balanced this work with his role as a **researcher**. In this regard, he has published numerous articles in specialized journals on topics such as **voice signal management**, the **Fast Fourier Transform** algorithm or the **Adaptive Filter**. In this way, his work has allowed the design of innovative products through the implementation of Artificial Intelligence. One example is that he has used this emerging tool to improve vehicle safety by monitoring driver distraction, which has helped to reduce traffic accidents and raise road safety standards.

He has also actively participated as a speaker at various global **conferences**, where he shares the latest advances in the field of engineering and technology.

Mr. Sakri, Shailesh

- Director of Automotive Audio Software at Harman International, Karnataka, India
- Director of Audio Algorithms at Knowles Intelligent Audio in Mountain View, California
- Audio Manager at Amazon Lab126 in Sunnyvale, California
- Technology Architect at Infosys Technologies Ltd in Texas, United States
- Digital Signal Processing Engineer at Aureole Technologies in Karnataka, India
- Technical Manager, Sasken Technologies Limited in Karnataka, India
- Master of Technology in Artificial Intelligence from Birla Institute of Technology & Science, Pilani
- B.Sc. degree in Electronics and Communications from Gulbarga University Member of Signal Processing Society of India

Thanks to TECH, you will be able to learn with the best professionals in the world"

Management

Mr. Espinosa Corbellini, Daniel

- Expert consultant in Audio Equipment and Room Acoustics
- Professor at the School of Engineering of Puerto Real, University of Cadiz
- Project Engineer in the company of Electrical Installations Coelan
- Audio Technician in Sales and Installations in the company Daniel Sonido
- Industrial Technical Engineer in Industrial Electronics at the University of Cadiz
- Industrial Engineer in Industrial Organization from the University of Cadiz
- Master's Degree in Evaluation and Management of Noise Pollution from the University of Cadiz
- Master's Degree in Acoustic Engineering from the University of Cadiz and the University of Granada
- Certificate of Advanced Studies from the University of Cadiz

Professors

Dr. De La Hoz Torres, María Luisa

- Technical Architect in the Department of Works and Urbanism in the City Council of Porcuna
- Research Teaching Staff at the University of Granada
- Lecturer in Building Degree at the School of Building Engineering, University of Granada
- Professor in Degree in Architectural Studies at the School of Architecture at the University of Granada
- Lecturer in Physics Degree, University of Granada
- Professor in Chemical Engineering Degree at the School of Civil Engineering at the University of Granad
- Professor in Telecommunication Technologies Engineering Degree at the School of Civil Engineering, University of Granada
- Andrés Lara Prize 2019 to the young acoustic researcher awarded by the Spanish Society of Acoustics
- PhD in the Civil Engineering Program at the University of Granada
- Degree in Technical Architecture by the University of Granada
- Degree in Building Engineering from the University of Granada
- Master's Degree in Management and Integral Safety in Building by the University of Granada
- Master's Degree in Acoustics Engineering from the University of Granada
- Master's Degree in Compulsory Secondary Education, Vocational Training and Language Teaching. Specialization in Technology, Computer Science and Industrial Processes

Dr. Aguilar Aguilera, Antonio

- Technical Architect at the Villanueva del Trabuco Town Hall
- Technical Architect Department of Works and Urban Planning at the Villanueva del Trabuco Town Hall
- Teaching and Research Staff at the University of Granada
- Researcher of the group TEP-968 Technologies for the Circular Economy (TEC)
- Professor in the Degree in Building Engineering in the Department of Architectural Constructions of the University of Granada in the subjects of Organization and Programming in Building and Prevention and Safety
- Professor in the Degree in Physics in the Department of Applied Physics of the University of Granada in the subject of Physics of the Environment
- Andrés Lara Prize, awarded by the Spanish Society of Acoustics (SEA), to the best work of a young researcher in acoustic engineering
- PhD in Civil Engineering Program at the University of Granada
- Degree in Technical Architecture from the University of Granada
- Master's Degree in Building Management and Safety from the University of Granada
- Master's Degree in Acoustic Engineering from the University of Granada
- Professor in the Degree in Engineering of Telecommunication Technologies in the Department of Applied Physics in the subject Applied Physics to Telecommunications

Dr. Muñoz Montoro, Antonio Jesús

- Researcher in musical and biomedical signals and their applications
- Assistant Professor at the University of Oviedo
- Teaching and Research Staff at the Distance University of Madrid
- Interim Substitute Professor at the University of Oviedo.
- Professor and Tutor at the Associated Center of the UNED in Jaén
- Research group "Signal Processing and Telecommunication Systems" (TIC188) of the University of Jaén
- Research Group "Quantum and High Performance Computing" of the University of Ovied
- PhD in Telecommunication Engineering from the University of Jaén
- Technical Telecommunication Engineer from the University of Malaga

Ms. Balagué García, María

- Acoustics Laboratory Technician at Audiotec
- Researcher in the Department of Applied Physics at the Polytechnic University of Valencia
- Audiovisual Technician at the Polytechnic University of Valencia
- Master's Degree in Acoustic Engineering at the Polytechnic University of Valencia
- Degree in Telecommunications, Sound and Image Systems Engineering from the Polytechnic University of Valencia

Dr. Velasco, Jesús

- Director of Acoustic and Audio Engineering at iA2
- Engineer and Technical Advisor at Dubbing Brothers Spain
- Master's Degree in Teacher Training at the European University of Madrid
- Master's Degree in Architectural Acoustics and Environment from Ramón Llull University
- Technical Engineer in Telecommunications, Sound and Image from the Polytechnic University of Madrid

Mr. Arroyo Chuquin, Jorge Santiago

- Consultant and Acoustical Designer at AKUO Acoustical Engineering
- Career Coordinator in the Higher Technology in Sound and Acoustics
- Master's Degree in Technology and Educational Innovation from the Technical University of the North
- Engineer in Sound and Acoustics from the University of the Americas

Mr. Leiva Minango, Danny Vladimir

- Acoustics and Sound Engineer at El Jabalí Estudio Quito.
- Director of Research and Projects at the Higher Technological University Institute of Visual Arts
- Acoustics and Architecture Project Technician at ProAcustica.
- Master's Degree in University Teaching at César Vallejo University
- Master's Degree in Business Administration from the Andean University Simon Bolivar
- Engineering in Acoustics and Sound from the University of the Americas

06

Educational Plan

The contents that make up this degree are designed by a highly specialized teaching group in Acoustic Engineering. Therefore, students are guaranteed access to a syllabus that stands out both for its high quality and for meeting the requirements of today's labor market. Composed of 10 complete modules, the study plan will analyze advances in areas such as acoustic signal detection, room acoustics or acoustic insulation. Thanks to this, graduates will incorporate into their practice the most advanced data analysis techniques to evaluate noise levels, vibrations and acoustic characteristics in different contexts.

This Hybrid Professional Master's Degree gives you the opportunity to expand your knowledge in a real scenario, with the maximum scientific rigor of an institution at the forefront of technology"

Module 1. Acoustical Physics Engineering

1.1. Mechanical Vibrations
 1.1.1. Simple Oscillator
 1.1.2. Damped and Forced Oscillations
 1.1.3. Mechanical Resonance
1.2. Vibrations in Strings and Rods
 1.2.1. The Vibrating String. Transverse Waves
 1.2.2. Equation of the Longitudinal and Transverse Waves in Rods
 1.2.3. Transverse Vibrations in Bars Individual Cases
1.3. Vibrations in Membranes and Plates
 1.3.1. Vibration of a Plane Surface
 1.3.2. Two-Dimensional Wave Equation for a Stretched Membrane
 1.3.3. Free Vibrations of a Fixed Membrane
 1.3.4. Forced Vibrations of a Membrane
1.4. Acoustic Wave Equation. Simple Solutions
 1.4.1. The Linearized Wave Equation
 1.4.2. Velocity of Sound in Fluids
 1.4.3. Plane and Spherical Waves. The Point Source
1.5. Transmission and Reflection Phenomena
 1.5.1. Changes of Medium
 1.5.2. Transmission at Normal and Oblique Incidence
 1.5.3. Specular Reflection. Snell's Law
1.6. Absorption and Attenuation of Sound Waves in Fluids
 1.6.1. Absorption Phenomenon
 1.6.2. Classical Absorption Coefficient
 1.6.3. Absorption Phenomena in Liquids
1.7. Radiation and Reception of Acoustic Waves
 1.7.1. Pulsed Sphere Radiation. Simple Sources. Intensity
 1.7.2. Dipole Radiation. Directivity
 1.7.3. Near-Field and Far-Field Behavior
1.8. Diffusion, Refraction and Diffraction of Acoustic Waves
 1.8.1. Non-Specular Reflection. Difusion
 1.8.2. Refraction Temperature Effects
 1.8.3. Diffraction. Border or Grid Effect
1.9. Stationary Waves: Pipes, Cavities, Waveguides
 1.9.1. Resonance in Open and Closed Tubes
 1.9.2. Sound Absorption in Tubes. Kundt Tube
 1.9.3. Rectangular, Cylindrical and Spherical Cavities
1.10. Resonators, Ducts and Filters
 1.10.1. Long Wavelength Limit
 1.10.2. Helmholtz Resonator
 1.10.3. Acoustic Impedance
 1.10.4. Duct-Based Acoustic Filters

Module 2. Psychoacoustics and Acoustic Signal Detection

2.1. Noise. Sources
 2.1.1. Sound. Transmission Speed, Pressure and Wavelength
 2.1.2. Noise. Background Noise
 2.1.3. Omnidirectional Noise Source. Power and Sound Intensity
 2.1.4. Acoustic Impedance for Plane Waves
2.2. Sound Measurement Levels
 2.2.1. Weber-Fechner Law. The Decibel
 2.2.2. Sound Pressure Level
 2.2.3. Sound Intensity Level
 2.2.4. Sound Power Level
2.3. Measurement of the Acoustic Field in Decibels (Db)
 2.3.1. Sum of Different Levels
 2.3.2. Sum of Equal Levels
 2.3.3. Subtraction of Levels. Correction for Background Noise

2.4. Binaural Acoustics
- 2.4.1. Structure of the Aural Model
- 2.4.2. Range and Sound Pressure-Frequency Relationship
- 2.4.3. Detection Thresholds and Exposure Limits
- 2.4.4. Physical Model

2.5. Psychoacoustic and Physical Measurements
- 2.5.1. Loudness and Loudness Level. Fones
- 2.5.2. Pitch and Frequency. Tone. Spectral Range
- 2.5.3. Equal Loudness Curves (Isophonic). Fletcher and Munson and Others

2.6. Acoustic Perceptual Properties
- 2.6.1. Sound Masking. Tones and Noise Bands
- 2.6.2. Temporal Masking. Pre and Post Masking
- 2.6.3. Frequency Selectivity of the Ear. Critical Bands
- 2.6.4. Non-Linear Perceptual and Other Non-Linear Effects. Hass Effect and Doppler Effect

2.7. The Phonator System
- 2.7.1. Mathematical Model of the Vocal Tract
- 2.7.2. Emission Times, Dominant Spectral Content and Level of the Emission
- 2.7.3. Directivity of the Vocal Emission. Polar Curve

2.8. Spectral Analysis and Frequency Bands
- 2.8.1. Frequency Weighting Curves A (dBA). Other Spectral Weightings
- 2.8.2. Spectral Analysis by Octaves and Octave Thirds. Concept of Octaves
- 2.8.3. Pink Noise and White Noise
- 2.8.4. Other Noise Bands Used in Signal Detection and Analysis

2.9. Atmospheric Attenuation of Sound in Free Field
- 2.9.1. Attenuation Due to Temperature and Atmospheric Pressure Variations in the Speed of Sound
- 2.9.2. Air Absorption Effect
- 2.9.3. Attenuation Due to Height to Ground and Wind Speed
- 2.9.4. Attenuation Due to Turbulence, Rain, Snow, or Vegetation
- 2.9.5. Attenuation Due to Noise Barriers or Terrain Variation Due to Interference

2.10. Temporal Analysis and Acoustic Indices of Perceived Intelligibility
- 2.10.1. Subjective Perception of First Acoustic Reflections. Echo Zones
- 2.10.2. Floating Echo
- 2.10.3. Speech Intelligibility. Calculation of %ALCons and STI/RASTI

Module 3. Advanced Acoustic Instrumentation

3.1. Noise
- 3.1.1. Noise Descriptors by Energy Content Rating: LAeq, SEL
- 3.1.2. Noise Descriptors by Temporal Variation Rating: LAnT
- 3.1.3. Noise Categorization Curves: NC, PNC, RC and NR

3.2. Pressure Measurement
- 3.2.1. Sound Level Meter. General Description, Structure and Operation by Blocks.
- 3.2.2. Frequency Weighting Analysis. Networks A, C, Z
- 3.2.3. Temporal Weighting Analysis. Slow, Fast, Impulse Networks
- 3.2.4. Integrating Sound Level Meter and Dosimeter (Laeq and SEL). Classes and Types Standards
- 3.2.5. Phases of Metrological Control. Standards
- 3.2.6. Calipers and Pistophones

3.3. Intensity Measurement
- 3.3.1. Intensimetry. Properties and Applications
- 3.3.2. Intensimetric Probes
  - 3.3.2.1. Pressure/Pressure and Pressure/Velocity Types
- 3.3.3. Methods of Calibration. Uncertainties

3.4. Sources of Acoustic Excitation
- 3.4.1. Dodecahedral Omnidirectional Source. International Standards
- 3.4.2. Airborne Impulsive Sources. Gun and Acoustic Balloons
- 3.4.3. Structural Impulsive Sources. Impact Machine

3.5. Vibration Measurement
- 3.5.1. Piezoelectric Accelerometers
- 3.5.2. Displacement, Velocity and Acceleration Curves
- 3.5.3. Vibration Analyzers. Frequency Weightings
- 3.5.4. Parameters and Calibration

3.6. Measuring Microphones
- 3.6.1. Types of Measuring Microphones
  - 3.6.1.1. The Condenser and Pre-Polarized Microphone. Basis of Operation
- 3.6.2. Design and Construction of Microphones
  - 3.6.2.1. Fuzzy Field, Random and Pressure Field
- 3.6.3. Sensitivity, Response, Directivity, Range and Stability
- 3.6.4. Environmental and Operator Influences. Measurement with Microphones

3.7. Acoustic Impedance Measurement
- 3.7.1. Impedance Tube (Kundt) Methods: Standing Wave Ranging Method
- 3.7.2. Determination of the Sound Absorption Coefficient at Normal Incidence. ISO 10534-2:2002 Transfer Function Method
- 3.7.3. Surface Method: Impedance Gun

3.8. Acoustic Measurement Chambers
- 3.8.1. Anechoic Chamber. Design and Materials
- 3.8.2. Semi-Anechoic Chamber. Design and Materials
- 3.8.3. Reverberation Chamber. Design and Materials

3.9. Other Measurement Systems
- 3.9.1. Automatic and Autonomous Measurement Systems for Environmental Acoustics.
- 3.9.2. Measuring Systems by Data Acquisition Card and Software
- 3.9.3. Systems Based on Simulation Software

3.10. Uncertainty in Acoustic Measurement
  - 3.10.1.1. Sources of Uncertainty
  - 3.10.1.2. Reproducible and Non-Reproducible Measurements
  - 3.10.1.3. Direct and Indirect Measurements

Module 4. Audio Signal Processing and Systems

4.1. Signals
- 4.1.1. Continuous and Discrete Signals
- 4.1.2. Periodic and Complex Signals
- 4.1.3. Random and Stochastic Signals

4.2. Series and Fourier Transform
- 4.2.1. Fourier Series and Fourier Transform. Analysis and Synthesis
- 4.2.2. Time Domain versus Frequency Domain
- 4.2.3. Complex Variables and Transfer Function

4.3. Sampling and Reconstruction of Audio Signals
- 4.3.1. A/D Conversion
  - 4.3.1.1. Sample Size, Coding and Sampling Rate
- 4.3.2. Quantization Error. Synchronization Error (Jitter)
- 4.3.3. D/A Conversion. Nyquist-Shannon Theorem
- 4.3.4. Aliasing Effect (Masking)

4.4. Frequency Response Analysis of Systems
- 4.4.1. The Discrete Fourier Transform. DFT
- 4.4.2. The Fast Fourier Transform FFT
- 4.4.3. Bode Diagram (Magnitude and Phase)

4.5. Analog IIR Signal Filters
- 4.5.1. Filtering Types. HP, LP, PB
- 4.5.2. Filter Order and Attenuation
- 4.5.3. Q Types. Butterworth, Bessel, Linkwitz-Riley, Chebysheb, Elliptical
- 4.5.4. Advantages and Disadvantages of Different Filtering

4.6. Analysis and Design of Digital Signal Filters
- 4.6.1. FIR (Finite impulse Response)
- 4.6.2. IIR (Infinite Impulse Response)
- 4.6.3. Design with Software Tools such as Matlab

4.7. Signal Equalization
- 4.7.1. EQ Types. HP, LP, PB
- 4.7.2. EQ Slope (Attenuation)
- 4.7.3. EQ Q (Quality Factor)
- 4.7.4. EQ Cut Off (Cut Off Frequency)
- 4.7.5. EQ Boost (Boost)

4.8. Calculation of Acoustic Parameters Using Signal Analysis and Signal Processing Software
- 4.8.1. Transfer Function and Signal Convolution
- 4.8.2. IR Curve (Impulse Response)
- 4.8.3. RTA (Real Time Analyzer) Curve
- 4.8.4. Step Response Curve
- 4.8.5. RT 60, T30, T20 Curve

4.9. Statistical Presentation of Parameters in the Signal Processing Software
- 4.9.1. Signal Smoothing
- 4.9.2. Waterfall
- 4.9.3. TR Decay
- 4.9.4. Spectrogram

4.10. Audio Signal Generation
- 4.10.1. Analog Signal Generators. Tones and Random Noise
- 4.10.2. Digital Pink and White Noise Generators
- 4.10.3. Tonal or Sweep Generators

Module 5. Electroacoustics and Audio Equipment

5.1. Laws of Electroacoustic Sound Reinforcement and Public Address (PA)
- 5.1.1. Increase of Sound Pressure Level (SPL) with Power
- 5.1.2. Attenuation of Sound Pressure Level (SPL) with Distance
- 5.1.3. Variation of Sound Intensity Level (SIL) with Distance and Number of Sources
- 5.1.4. Sum of Coherent and Non-Coherent Signals in Phase. Radiation and Directivity
- 5.1.5. Sound Distorting Effects in Propagation and Solutions to Follow

5.2. Electroacoustic Transduction
- 5.2.1. Electroacoustic Analogies
    - 5.2.1.1. Electromechanical (TEM) and Mechanoacoustic (TMA) Spinner
- 5.2.2. Electroacoustic Transducers. Types and Particularities
- 5.2.3. Electroacoustic Model of the Moving Coil Transducer. Equivalent Circuits

5.3. Electrodynamic Direct Radiating Transducer
- 5.3.1. Structural Components
- 5.3.2. Features
    - 5.3.2.1. Pressure and Phase Response, Impedance Curve, Maximum and RMS Power, Sensitivity and Performance, Directivity Polar Pattern, Polarity, Distortion Curve.
- 5.3.3. Thiele-Small Parameters and Wright Parameters
- 5.3.4. Frequency Classification
    - 5.3.4.1. Radiator Types. Function as Monopole/Dipole
- 5.3.5. Alternative Models: Coaxial or Elliptical

5.4. Indirect Radiation Transducers
- 5.4.1. Speakers, Diffusers and Acoustic Lenses. Structure and Types
- 5.4.2. Directivity Control. Waveguides
- 5.4.3. Compression Core

5.5. Professional Acoustic Enclosures
- 5.5.1. Infinite Screen
- 5.5.2. Acoustic Suspension. Design. Modal Problems
- 5.5.3. Low Frequency Reflector (Reflex). Design
- 5.5.4. Acoustic Labyrinth. Design
- 5.5.5. Transmission Line Design

5.6. Filtering Circuits and Crossovers
- 5.6.1. Passive Crossover Filters. Order
    - 5.6.1.1. First Order and Sum Equations
- 5.6.2. Active Crossover Filters. Analog and Digital
- 5.6.3. Crossover Parameters
    - 5.6.3.1. Paths, Crossover Frequency, Order, Slope and Quality Factor
- 5.6.4. Notch Filters and L-Pad and Zobel Networks

5.7. Audio Arrays
- 5.7.1. Single Point Source and Dual Point Source
- 5.7.2. Coverage. Constant and Proportional Directivity
- 5.7.3. Grouping of Sound Sources. Coupled Sources

5.8. Amplification Equipment
- 5.8.1. Class A, B, AB, C and D Amplifiers. Amplification Curves
- 5.8.2. Pre-Amplification and Voltage Amplification. High Impedance or Line Amplifier
- 5.8.3. Measurement and Calculation of the Voltage Gain of an Amplifier

5.9. Other Audio Equipment in Recording and Audio Production Studios
- 5.9.1. ADC/DAC Converters. Performance Characteristics
- 5.9.2. Equalizers. Types and Adjustment Parameters
- 5.9.3. Dynamics Processors. Types and Adjustment Parameters
- 5.9.4. Limiters, Noise Gates, Delay and Reverb Units. Adjustment Parameters
- 5.9.5. Mixers. Types and Functions of the Modules. Spatial Integration Problems

5.10. Monitoring in Recording Studios and Radio and Television Broadcasting Stations
- 5.10.1. Near-Field and Far-Field Monitors in Control Rooms
- 5.10.2. Flush- Mount. Acoustic Effects. Comb Filter
- 5.10.3. Time Alignment and Phase Correction

Module 6. Room Acoustics

6.1. Distinction of Acoustic Insulation in Architecture
- 6.1.1. Distinction between Acoustic Insulation and Acoustic Treatment. Improvement of Acoustic Comfort
- 6.1.2. Transmission Energy Balance. Incident, Absorbed and Transmitted Sound Power
- 6.1.3. Sound Insulation of Enclosures. Sound Transmission Index

6.2. Transmission of Sound
- 6.2.1. Noise Transmission Typology. Airborne and Direct and Flanking Noise
- 6.2.2. Propagation Mechanisms. Reflection, Refraction, Absorption and Diffraction.
- 6.2.3. Sound Reflection and Absorption Rates
- 6.2.4. Sound Transmission Paths between Two Adjacent Enclosures

6.3. Sound Insulation Performance of Buildings
- 6.3.1. Apparent Sound Reduction Index, R'
- 6.3.2. Standardized Difference in Level, DnT
- 6.3.3. Standardized Difference in Level, Dn

6.4. Quantities for Describing the Sound Insulation Performance of Elements
  6.4.1. Acoustic Reduction Index, R
  6.4.2. Acoustic Reduction Improvement Ratio, ΔR
  6.4.3. Normalized Difference in Level of an Element, Dn,e
6.5. Airborne Sound Insulation Between Enclosures
  6.5.1. Statement of the Problem
  6.5.2. Calculation Model
  6.5.3. Measurement Indexes
  6.5.4. Technical Construction Solutions
6.6. Impact Noise Insulation Between Enclosures
  6.1.1. Statement of the Problem
  6.1.2. Calculation Model
  6.1.3. Measurement Indexes
  6.1.4. Technical Construction Solutions
6.7. Airborne Noise Insulation against External Noise
  6.7.1. Statement of the Problem
  6.7.2. Calculation Model
  6.7.3. Measurement Indexes
  6.7.4. Technical Construction Solutions
6.8. Analysis of Interior to Exterior Noise Transmission
  6.8.1. Statement of the Problem
  6.8.2. Calculation Model
  6.8.3. Measurement Indexes
  6.8.4. Technical Construction Solutions
6.9. Analysis of Sound Levels Produced by Installation and Machinery Equipment
  6.9.1. Statement of the Problem
  6.9.2. Analysis of Sound Transmission through Installations
  6.9.3. Measurement Indexes

6.10. Sound Absorption in Enclosed Spaces
- 6.10.1. Total Equivalent Absorption Area
- 6.10.2. Analysis of Spaces with Irregular Distribution of Absorption
- 6.10.3. Analysis of Irregularly Shaped Spaces

Module 7. Acoustic Insulation

7.1. Acoustic Characterization in Enclosures
- 7.1.1. Sound Propagation in Open Space
- 7.1.2. Sound Propagation in an Enclosed Space. Reflected Sound
- 7.1.3. Theories of Room Acoustics: Wavelet, Statistical and Geometrical Theory

7.2. Analysis of Wavelet Theory (f≤fs)
- 7.2.1. Modal Problems of a Room Derived from the Acoustic Wave Equation
- 7.2.2. Axial, Tangential and Oblique Modes
  - 7.2.2.1. Three-Dimensional Equation and Modal Strengthening Characteristics of the Different Types of Modes
- 7.2.3. Modal Density. Schroeder Frequency. Spectral Curve of Theory Application

7.3. Modal Distribution Criteria
- 7.3.1. Golden Measurements
  - 7.3.1.1. Other Posterior Measurements (Bolt, Septmeyer, Louden, Boner, Sabine)
- 7.3.2. Walker and Bonello Criterion
- 7.3.3. Bolt Diagram

7.4. Statistical Theory Analysis (fs≤f≤4fs)
- 7.4.1. Homogeneous Diffusion Criterion. Sound Temporal Energy Balance
- 7.4.2. Direct and Reverberant Field. Critical Distance and Constant of the Room
- 7.4.3. TR. Sabine Calculation. Energy Decay Curve (ETC Curve)
- 7.4.4. Optimal Reverberation Time. Beranek Tables

7.5. Analysis of the Geometrical Theory (f≥4fs)
- 7.5.1. Specular and Non-Specular Reflection. Application of Snell's Law for f≥4fs
- 7.5.2. First Order Reflections. Echogram
- 7.5.3. Floating Echo

7.6. Materials for Acoustic Conditioning. Absorption
- 7.6.1. Absorption of Membranes and Fibers. Porous Materials
- 7.6.2. Acoustic Reduction Coefficient NRC
- 7.6.3. Variation of Absorption as a Function of the Material Characteristics (Thickness, Porosity, Density, etc.)

7.7. Parameters for the Evaluation of Acoustic Quality in Enclosures
- 7.7.1. Energetic Parameters (G, C50, C80, ITDG)
- 7.7.2. Reverberation Parameters (TR, EDT, BR, Br)
- 7.7.3. Spatiality Parameters (IACCE, IACCL, LG, LFE, LFCE)

7.8. Acoustic Design Procedures and Considerations for Room Design
- 7.8.1. Reduction of Direct Sound Attenuation from Room Shape
- 7.8.2. Analysis of Room Shape in Relation to Reflections
- 7.8.3. Prediction of the Noise Level in a Room

7.9. Acoustic Diffusers
- 7.9.1. Polycylindrical Diffusers
- 7.9.2. Schroeder Maximum Sequence Length (MLS) Diffusers
- 7.9.3. Quadratic Residual Schroeder Diffusers (QRD)
  - 7.9.3.1. One-Dimensional QRD Diffusers
  - 7.9.3.2. Two-Dimensional QRD Diffusers
  - 7.9.3.3. Primitive Root Schroeder Diffusers (PRD)

7.10. Variable Acoustics in Multifunctional Spaces. Elements for Their Design
- 7.10.1. Design of Variable Acoustics Spaces from Variable Physical Elements
- 7.10.2. Design of Variable Acoustics Spaces from Electronic Systems
- 7.10.3. Comparative Analysis of the Use of Physical Elements versus Electronic Systems

Module 8. Acoustic Installations and Testing

8.1. Acoustic Study and Reports
- 8.1.1. Types of Acoustic Technical Reports
- 8.1.2. Contents of Studies and Reports
- 8.1.3. Types of Acoustic Tests

8.2. Planning and Development of Airborne Sound Insulation Tests
- 8.2.1. Measurement Requirements
- 8.2.2. Recording of Results
- 8.2.3. Test Report

8.3. Evaluation of Global Parameters for Airborne Sound Insulation of Buildings and Building Elements
- 8.3.1. Procedure for the Evaluation of Global Parameters
- 8.3.2. Comparative Method
- 8.3.3. Spectral Matching Terms (C or Ctr)
- 8.3.4. Results Evaluation

8.4. Planning and Development of Impact Noise Insulation Tests
- 8.4.1. Measurement Requirements
- 8.4.2. Recording of Results
- 8.4.3. Test Report

8.5. Evaluation of Global Parameters for Impact Noise Insulation of Buildings and Building Elements
- 8.5.1. Procedure for the Evaluation of Global Parameters
- 8.5.2. Comparative Method
- 8.5.3. Results Evaluation

8.6. Planning and Development of Airborne Sound Insulation Tests in Facades
- 8.6.1. Measurement Requirements
- 8.6.2. Recording of Results
- 8.6.3. Test Report

8.7. Planning and Development of Reverberation Time Tests
- 8.7.1. Measurement Requirements: Performance Venues
- 8.7.2. Measurement Requirements: Ordinary Enclosures
- 8.7.3. Measurement Requirements: Open-Plan Offices
- 8.7.4. Recording of Results
- 8.7.5. Test Report

8.8. Planning and Development of Tests to Measure the Speech Transmission Index (STI) in Enclosures
- 8.8.1. Measurement Requirements
- 8.8.2. Recording of Results
- 8.8.3. Test Report

8.9. Planning and Development of Tests for the Evaluation of Interior-to-Exterior Noise Transmission
- 8.9.1. Basic Measurement Requirements
- 8.9.2. Recording of Results
- 8.9.3. Test Report

8.10. Noise Control
- 8.10.1. Types of Sound Limiting Devices
- 8.10.2. Sound Limiters
  - 8.10.2.1. Peripherals
- 8.10.3. Ambient Noise Meter

Module 9. Recording Systems and Studio Recording Techniques

9.1. The Recording Studio
- 9.1.1. The Recording Room
- 9.1.2. Design of Recording Rooms
- 9.1.3. The Control Room
- 9.1.4. Control Room Design

9.2. The Recording Process
- 9.2.1. Pre-Production
- 9.2.2. Recording in the Studio
- 9.2.3. Post-Production

9.3. Technical Production in the Recording Studio
- 9.3.1. Roles and Responsibilities in Production
- 9.3.2. Creativity and Decision Making
- 9.3.3. Resource Management
- 9.3.4. Type of Recording
- 9.3.5. Room Types
- 9.3.6. Technical Equipment

9.4. Audio Formats
- 9.4.1. Audio File Formats
- 9.4.2. Audio Quality and Data Compression
- 9.4.3. Format Conversion and Resolution

9.5. Cables and Connectors
- 9.5.1. Power Cabling
- 9.5.2. Charging Cabling
- 9.5.3. Analog Signal Cabling
- 9.5.4. Digital Signal Cabling
- 9.5.5. Balanced, Unbalanced, Stereo and Monophonic Signal

9.6. Audio Interfaces
- 9.6.1. Functions and Characteristics of Audio Interfaces
- 9.6.2. Configuration and Use of Audio Interfaces
- 9.6.3. Choosing the Right Interface for Each Project

9.7. Studio Headphones
- 9.7.1. Structure
- 9.7.2. Types of Headphones
- 9.7.3. Specifications
- 9.7.4. Binaural Playback

9.8. The Audio Chain
- 9.8.1. Signal Routing
- 9.8.2. Recording Chain
- 9.8.3. Monitoring Chain
- 9.8.4. MIDI Recording

9.9. Mixer
- 9.9.1. Types of Inputs and Their Characteristics
- 9.9.2. Channel Functions
- 9.9.3. Mixers
- 9.9.4. DAW Controllers

9.10. Studio Microphone Techniques
- 9.10.1. Microphone Positioning
- 9.10.2. Microphone Selection and Configuration
- 9.10.3. Advanced Microphone Techniques

Module 10. Environmental Acoustics and Action Plans

10.1. Analysis of Environmental Acoustics
- 10.1.1. Sources of Environmental Noise
- 10.1.2. Types of Environmental Noise as a Function of its Temporal Evolution
- 10.1.3. Effects of Environmental Noise on Human Health and the Environment

10.2. Indicators and Parameters of Environmental Noise
- 10.2.1. Aspects that Influence the Measurement of Environmental Noise
- 10.2.2. Indicators of Environmental Noise
  - 10.2.2.1. Day-Evening-Night Level (Lden)
  - 10.2.2.2. Day-Night Level (Ldn)
- 10.2.3. Others Indicators of Environmental Noise
  - 10.2.3.1. Traffic Noise Index (TNI)
  - 10.2.3.2. Noise Pollution Level (NPL)
  - 10.2.3.3. Level SEL

10.3. Measurement of Environmental Noise
- 10.3.1. International Measurement Standards and Protocols
- 10.3.2. Measurement Procedures
- 10.3.3. Environmental Noise Assessment Report

10.4. Noise Maps and Action Plans
- 10.4.1. Noise Measurements
- 10.4.2. General Noise Mapping Process
- 10.4.3. Noise Control Action Plans

10.5. Sources of Environmental Noise: Types
- 10.5.1. Traffic Noise
- 10.5.2. Railroad Noise
- 10.5.3. Aircraft Noise
- 10.5.4. Activity Noise

10.6. Noise Sources: Control Measures
- 10.6.1. Source Control
- 10.6.2. Propagation Control
- 10.6.3. Receiver Control

10.7. Traffic Noise Prediction Models
- 10.7.1. Traffic Noise Prediction Methods
- 10.7.2. Theories of Generation and Propagation
- 10.7.3. Factors Influencing Noise Generation
- 10.7.4. Factors affecting Propagation

10.8. Acoustic Barriers
- 10.8.1. Operation of an Acoustic Barrier. Principles
- 10.8.2. Types of Acoustic Barriers
- 10.8.3. Design of Acoustic Barriers

10.9. Evaluation of Noise Exposure in the Workplace
- 10.9.1. Identification of the Consequences of Exposure to High Noise Levels
- 10.9.2. Methods for Measuring and Assessing Noise Exposure (ISO 9612:2009)
- 10.9.3. Exposure Indices and Maximum Exposure Values
- 10.9.4. Technical Measures for Limiting Exposure

10.10. Assessment of Exposure to Mechanical Vibration Transmitted to the Human Body
- 10.10.1. Identification of the Consequences of Exposure to Whole Body Vibration
- 10.10.2. Methods of Measurement and Assessment
- 10.10.3. Exposure Indices and Maximum Exposure Values
- 10.10.4. Technical Measures for Limiting Exposure

You will be qualified to conduct research in Acoustic Engineering and propose innovative solutions based on scientific evidence"

07

Clinical Internship

After completing the online theoretical period, this program includes a practical training phase in a reference entity linked to the field of Acoustic Engineering. During this itinerary, the graduates will have at their disposal the support of a tutor, who will accompany them throughout the process, both in the preparation and in the development of the internship.

You will carry out your internship in a prestigious entity specialized in Acoustic Engineering"

The Internship Program of this program in Acoustic Engineering consists of a practical stay in a recognized company, lasting 3 weeks, from Monday to Friday with 8 consecutive hours of practical teaching with an assistant specialist.

During this on-site stay, students will be tutored by a professional in this industry, who will ensure that all the objectives for which this program has been designed are met. In this same line, their extensive knowledge in this field will enable students to progress quickly in the labor market.

Engineers have an excellent opportunity to learn by working in a field highly demanded by companies, which requires constant updating in order to offer services of the highest quality.

The practical part will be carried out with the active participation of the student performing the activities and procedures of each area of competence (learning to learn and learning to do), with the accompaniment and guidance of teachers and other fellow learners that facilitate teamwork and multidisciplinary integration as transversal competences for the praxis of Acoustic Engineering (learning to be and learning to relate).

The procedures described below will be the basis of the practical part of the program, and their implementation will be subject to the center's own availability and workload, the proposed activities being the following:

Module	Practical Activity
Technical Acoustics	Develop systems for the generation, transmission and reception of sound, ensuring optimum performance
	Perform sound and vibration measurements in diverse environments, using specialized measurement equipment to assess noise levels, acoustic quality, and structural vibrations
	Use simulation software to predict the acoustical behavior of structures, architectural spaces, and acoustical devices
	Implement solutions to improve acoustics in interior spaces (such as concert halls, recording studios, and offices) through the use of absorbent materials, diffusers, and acoustic isolators
Pumping Plants	Perform detailed noise level measurements in different areas of the pumping station using specialized equipment
	Identify and evaluate the main sources of noise within the pumping station (such as pumps, motors, fans or other mechanical equipment)
	Propose design solutions to reduce the noise generated, such as the installation of acoustic absorbing materials or sound barriers
	Implement measures to mitigate vibrations that may contribute to the perceived noise level, such as the use of vibration dampers and isolators
Audio Processing	Build audio systems for specific applications, including concert halls, recording studios, etc.
	Manage software to model and simulate sound propagation in different environments, helping to optimize the acoustic design of spaces and devices
	Develop algorithms for audio signal processing (noise cancellation, sound quality enhancement, audio comprehension, etc.)
	Carry out calibration and adjustment of audio equipment to ensure that it functions properly
Environmental Noise Management and Control Strategies	Perform accurate sound pressure level measurements in different environmental settings using specialized measurement equipment
	Assess the impact of noise generated by various sources on the surrounding environment
	Use modeling software to predict and simulate how noise will propagate in a given area
	Design strategies to reduce the effects of noise on the environment (such as implementation of noise barriers or changes in urban design)

Civil Liability Insurance

This institution's main concern is to guarantee the safety of the students and other collaborating agents involved in the internship process at the company. Among the measures dedicated to achieve this is the response to any incident that may occur during the entire teaching-learning process.

To this end, this entity commits to purchasing a civil liability insurance policy to cover any eventuality that may arise during the course of the internship at the center.

This liability policy for interns will have broad coverage and will be taken out prior to the start of the practical training period. That way professionals will not have to worry in case of having to face an unexpected situation and will be covered until the end of the internship program at the center.

General Conditions of the Internship Program

The general terms and conditions of the internship agreement for the program are as follows:

1. TUTOR: During the Hybrid Professional Master's Degree, students will be assigned with two tutors who will accompany them throughout the process, answering any doubts and questions that may arise. On the one hand, there will be a professional tutor belonging to the internship center who will have the purpose of guiding and supporting the student at all times. On the other hand, they will also be assigned with an academic tutor whose mission will be to coordinate and help the students during the whole process, solving doubts and facilitating everything they may need. In this way, the student will be accompanied and will be able to discuss any doubts that may arise, both clinical and academic.

2. DURATION: The internship program will have a duration of three continuous weeks, in 8-hour days, 5 days a week. The days of attendance and the schedule will be the responsibility of the center and the professional will be informed well in advance so that they can make the appropriate arrangements.

3. ABSENCE: If the students does not show up on the start date of the Hybrid Professional Master's Degree, they will lose the right to it, without the possibility of reimbursement or change of dates. Absence for more than two days from the internship, without justification or a medical reason, will result in the professional's withdrawal from the internship, therefore, automatic termination of the internship. Any problems that may arise during the course of the internship must be urgently reported to the academic tutor.

4. CERTIFICATION: Professionals who pass the Hybrid Professional Master's Degree will receive a certificate accrediting their stay at the center.

5. EMPLOYMENT RELATIONSHIP: the Hybrid Professional Master's Degree shall not constitute an employment relationship of any kind.

6. PRIOR EDUCATION: Some centers may require a certificate of prior education for the Hybrid Professional Master's Degree. In these cases, it will be necessary to submit it to the TECH internship department so that the assignment of the chosen center can be confirmed.

7. DOES NOT INCLUDE: The Hybrid Professional Master's Degree will not include any element not described in the present conditions. Therefore, it does not include accommodation, transportation to the city where the internship takes place, visas or any other items not listed.

However, students may consult with their academic tutor for any questions or recommendations in this regard. The academic tutor will provide the student with all the necessary information to facilitate the procedures in any case.

08

Where Can I Do the Internship?

TECH's philosophy is based on offering high quality academic programs, which is why it carefully selects the institutions for its students' Internship Programs. Thanks to this, students will have the opportunity to carry out their internships in companies of international prestige and in an environment of excellence. In this way, they will be able to be part of multidisciplinary teams led by experts in Acoustic Engineering.

You will carry out your Internship Program in a prestigious company, where you will be surrounded by the best professionals in Acoustic Engineering"

The student will be able to complete the practical part of this Hybrid Professional Master's Degree at the following centers:

Cones

Country: Spain

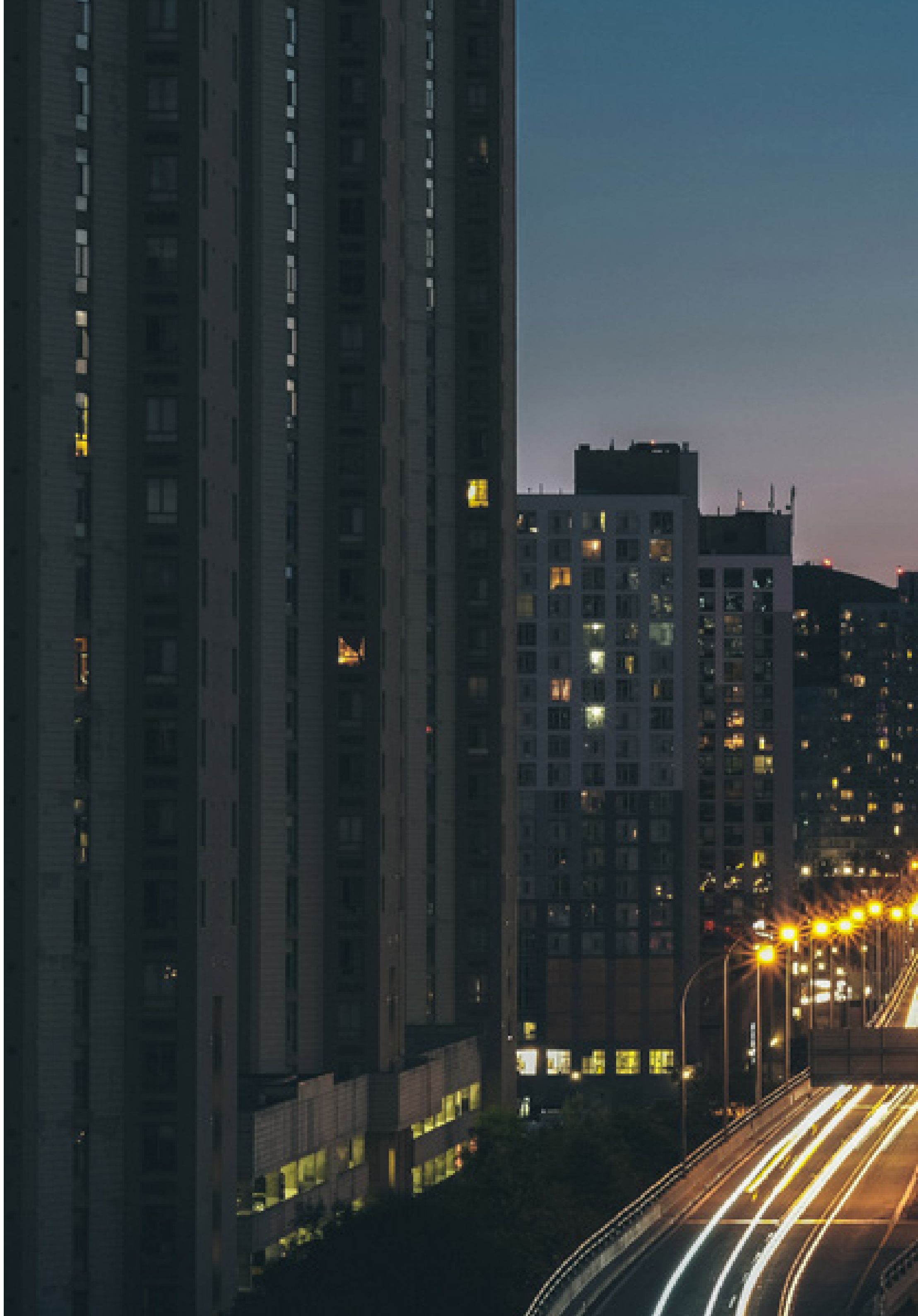
City: Madrid

Address: Calle Zinc, 3, Humanes de Madrid, 28970. Madrid

A prestigious construction company highly specialized in quality control of materials and geotechnical studies.

Related internship programs:

- Geotechnics and Foundations
- Acoustic Engineering



Delve into the most relevant theory in this field, subsequently applying it in a real work environment"

09
Methodology

This academic program offers students a different way of learning. Our methodology uses a cyclical learning approach: **Relearning.**
This teaching system is used, for example, in the most prestigious medical schools in the world, and major publications such as the **New England Journal of Medicine** have considered it to be one of the most effective.

Discover Relearning, a system that abandons conventional linear learning, to take you through cyclical teaching systems: a way of learning that has proven to be extremely effective, especially in subjects that require memorization"

Case Study to contextualize all content

Our program offers a revolutionary approach to developing skills and knowledge. Our goal is to strengthen skills in a changing, competitive, and highly demanding environment.

At TECH, you will experience a learning methodology that is shaking the foundations of traditional universities around the world"

You will have access to a learning system based on repetition, with natural and progressive teaching throughout the entire syllabus.

The student will learn to solve complex situations in real business environments through collaborative activities and real cases.

A learning method that is different and innovative

This TECH program is an intensive educational program, created from scratch, which presents the most demanding challenges and decisions in this field, both nationally and internationally. This methodology promotes personal and professional growth, representing a significant step towards success. The case method, a technique that lays the foundation for this content, ensures that the most current economic, social and professional reality is taken into account.

Our program prepares you to face new challenges in uncertain environments and achieve success in your career"

The case method is the most widely used learning system in the best faculties in the world. The case method was developed in 1912 so that law students would not only learn the law based on theoretical content. It consisted of presenting students with real-life, complex situations for them to make informed decisions and value judgments on how to resolve them. In 1924, Harvard adopted it as a standard teaching method.

What should a professional do in a given situation? This is the question that you are presented with in the case method, an action-oriented learning method. Throughout the program, the studies will be presented with multiple real cases. They will have to combine all their knowledge and research, and argue and defend their ideas and decisions.

Relearning Methodology

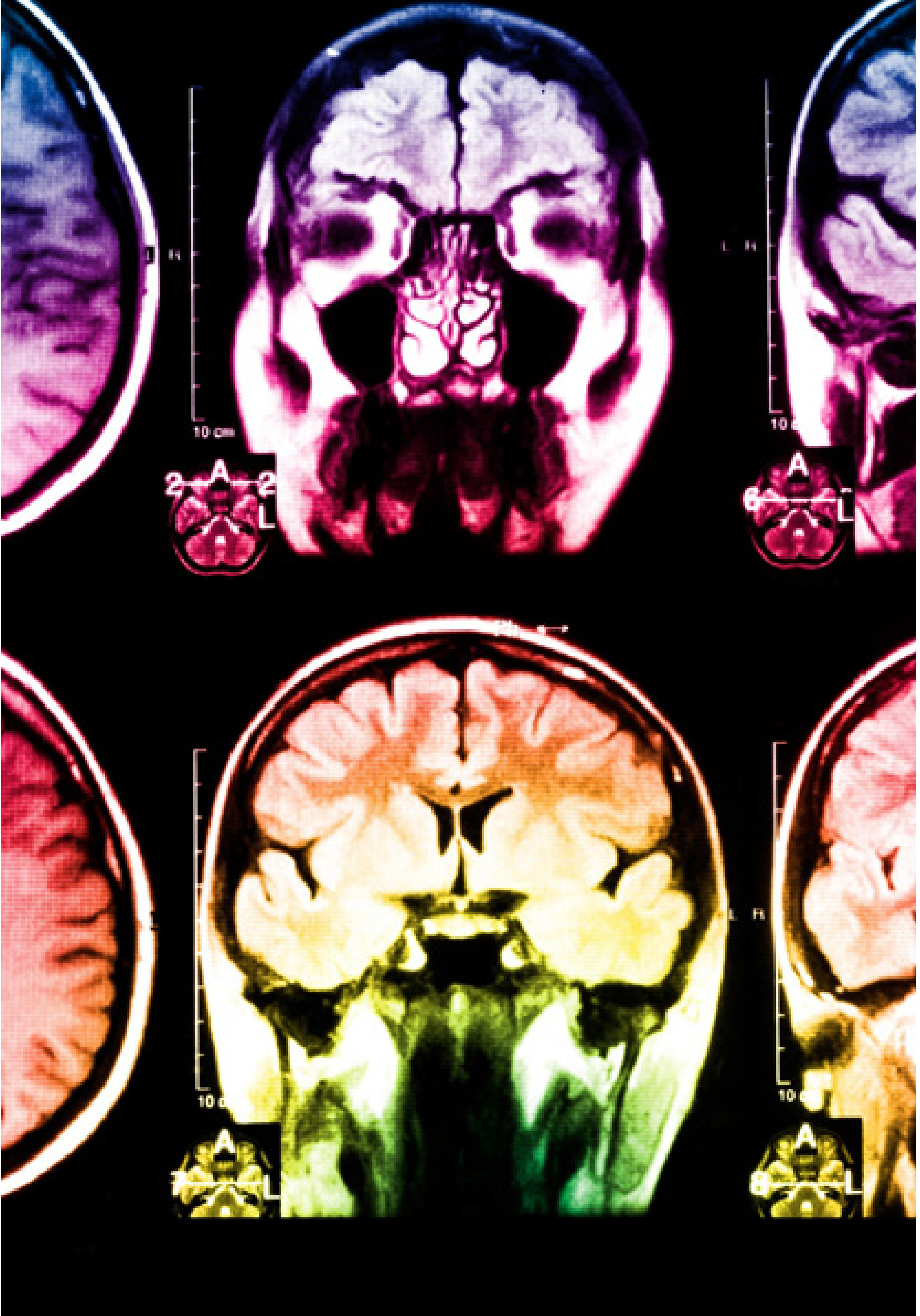
TECH effectively combines the Case Study methodology with a 100% online learning system based on repetition, which combines 8 different teaching elements in each lesson.

We enhance the Case Study with the best 100% online teaching method: Relearning.

In 2019, we obtained the best learning results of all online universities in the world.

At TECH, you will learn using a cutting-edge methodology designed to train the executives of the future. This method, at the forefront of international teaching, is called Relearning.

Our university is the only one in the world authorized to employ this successful method. In 2019, we managed to improve our students' overall satisfaction levels (teaching quality, quality of materials, course structure, objectives...) based on the best online university indicators.



In our program, learning is not a linear process, but rather a spiral (learn, unlearn, forget, and re-learn). Therefore, we combine each of these elements concentrically. This methodology has trained more than 650,000 university graduates with unprecedented success in fields as diverse as biochemistry, genetics, surgery, international law, management skills, sports science, philosophy, law, engineering, journalism, history, and financial markets and instruments. All this in a highly demanding environment, where the students have a strong socio-economic profile and an average age of 43.5 years.

Relearning will allow you to learn with less effort and better performance, involving you more in your training, developing a critical mindset, defending arguments, and contrasting opinions: a direct equation for success.

From the latest scientific evidence in the field of neuroscience, not only do we know how to organize information, ideas, images and memories, but we know that the place and context where we have learned something is fundamental for us to be able to remember it and store it in the hippocampus, to retain it in our long-term memory.

In this way, and in what is called neurocognitive context-dependent e-learning, the different elements in our program are connected to the context where the individual carries out their professional activity.

This program offers the best educational material, prepared with professionals in mind:

Study Material

All teaching material is produced by the specialists who teach the course, specifically for the course, so that the teaching content is highly specific and precise.

These contents are then applied to the audiovisual format, to create the TECH online working method. All this, with the latest techniques that offer high quality pieces in each and every one of the materials that are made available to the student.

Classes

There is scientific evidence suggesting that observing third-party experts can be useful.

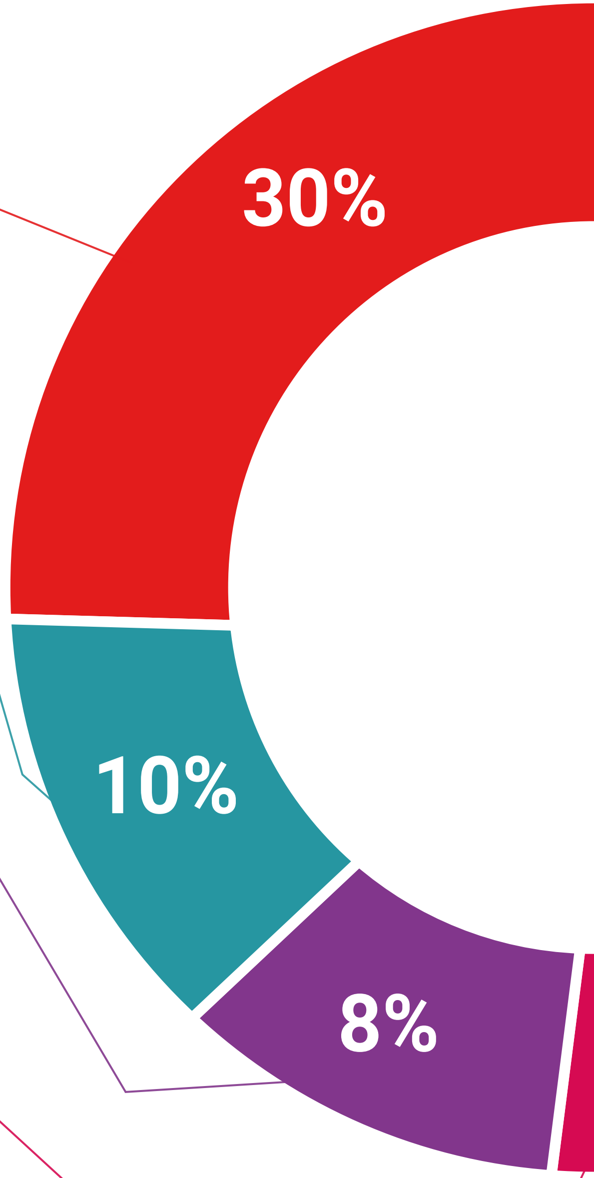
Learning from an Expert strengthens knowledge and memory, and generates confidence in future difficult decisions.

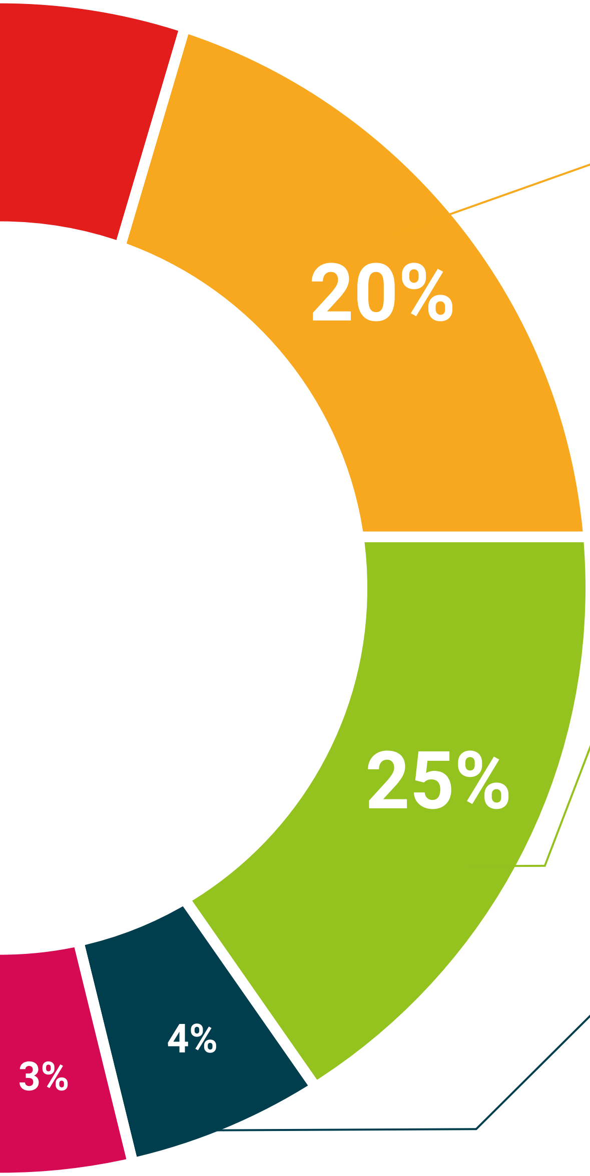
Practising Skills and Abilities

They will carry out activities to develop specific skills and abilities in each subject area. Exercises and activities to acquire and develop the skills and abilities that a specialist needs to develop in the context of the globalization that we are experiencing.

Additional Reading

Recent articles, consensus documents and international guidelines, among others. In TECH's virtual library, students will have access to everything they need to complete their course.





Case Studies

Students will complete a selection of the best case studies chosen specifically for this program. Cases that are presented, analyzed, and supervised by the best specialists in the world.

Interactive Summaries

The TECH team presents the contents attractively and dynamically in multimedia lessons that include audio, videos, images, diagrams, and concept maps in order to reinforce knowledge.

This exclusive educational system for presenting multimedia content was awarded by Microsoft as a "European Success Story".

Testing & Retesting

We periodically evaluate and re-evaluate students' knowledge throughout the program, through assessment and self-assessment activities and exercises, so that they can see how they are achieving their goals.

10 Certificate

The Hybrid Professional Master's Degree in Acoustic Engineering guarantees, in addition to the most rigorous and updated knowledge, access to a Hybrid Professional Master's Degree issued by TECH Global University.

Successfully complete this program and receive your university qualification without having to travel or fill out laborious paperwork"

This private qualification will allow you to obtain a **Hybrid Professional Master's Degree in Acoustic Engineering** endorsed by **TECH Global University**, the world's largest online university.

TECH Global University is an official European University publicly recognized by the Government of Andorra (***official bulletin***). Andorra is part of the European Higher Education Area (EHEA) since 2003. The EHEA is an initiative promoted by the European Union that aims to organize the international training framework and harmonize the higher education systems of the member countries of this space. The project promotes common values, the implementation of collaborative tools and strengthening its quality assurance mechanisms to enhance collaboration and mobility among students, researchers and academics.

This **TECH Global University** private qualification is a European program of continuing education and professional updating that guarantees the acquisition of competencies in its area of knowledge, providing a high curricular value to the student who completes the program.

Title: **Hybrid Professional Master's Degree in Acoustic Engineering**

Modality: **Hybrid (Online + Internship)**

Duration: **12 months**

Credits **60 + 4 ECTS**

tech global university

Mr./Ms. _________________, with identification document ____________
has successfully passed and obtained the title of:

Hybrid Professional Master's Degree in Acoustic Engineering

This is a private qualification of 1,920 hours of duration equivalent to 64 ECTS, with a start date of dd/mm/yyyy and an end date of dd/mm/yyyy.

TECH Global University is a university officially recognized by the Government of Andorra on the 31st of January of 2024, which belongs to the European Higher Education Area (EHEA).

In Andorra la Vella, on the 28th of February of 2024

Dr. Pedro Navarro Illana
Dean

This qualification must always be accompanied by the university degree issued by the competent authority to practice professionally in each country. Unique TECH Code: AFWORD23S techtitute.com/certificates

Hybrid Professional Master's Degree in Acoustic Engineering

General Structure of the Syllabus

Subject type	ECTS
Compulsory (CO)	60
Optional (OP)	0
External Work Placement (WP)	4
Master's Degree Thesis (MDT)	0
	Total 64

General Structure of the Syllabus

Year	Subject	ECTS	Type
1º	Acoustical Physics Engineering	6	CO
1º	Psychoacoustics and Acoustic Signal Detection	6	CO
1º	Advanced Acoustic Instrumentation	6	CO
1º	Audio Signal Processing and Systems	6	CO
1º	Electroacoustics and Audio Equipment	6	CO
1º	Room Acoustics	6	CO
1º	Acoustic Insulation	6	CO
1º	Acoustic Installations and Testing	6	CO
1º	Recording Systems and Studio Recording Techniques	6	CO
1º	Environmental Acoustics and Action Plans	6	CO

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Dean

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*Apostille Convention. In the event that the student wishes to have their paper diploma issued with an apostille, TECH Global University will make the necessary arrangements to obtain it, at an additional cost.

Hybrid Professional Master's Degree

Acoustic Engineering

Modality: **Hybrid (Online + Internship)**

Duration: **12 months**

Certificate: **TECH Global University**

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HybridProfessional Master’s Degree
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