Postgraduate Diploma

Architectural Acoustics Engineering

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Postgraduate Diploma
Architectural Acoustics Engineering

- Modality: **online**
- Duration: **6 months**
- Certificate: **TECH Technological University**
- Dedication: **16h/week**
- Schedule: **at your own pace**
- Exams: **online**

Website: **www.techtitute.com/pk/engineering/postgraduate-diploma/postgraduate-diploma-architectural-acoustics-engineering**

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01

Introduction

Increased concern about the health effects of noise has led to improved technologies and techniques for sound insulation and acoustics in buildings, music halls or factories. In this scenario, the role of the engineering professional is key, requiring a solid knowledge of acoustic physics, as well as methods of analysis and study for the design and control of sound. For this reason, TECH has created this 100% online program that takes the graduate to achieve in just 6 months an advanced learning, from the hands of the best experts in this field. A unique opportunity through the best digital university in the world according to Forbes.

With this 100% online Postgraduate Diploma you will have the skills to design and calculate acoustic insulation in enclosed spaces"

Music halls, recording studios, radio or television stations are very demanding environments in terms of soundproofing, although noise insulation in buildings is equally important. A relevance that comes along with the concern about the effects of noise on people's health and well-being.

In this context, technology has advanced in order to improve the analysis and measurement devices, while improving the techniques for the design of spaces. For this reason, TECH has developed this 6-month 100% online university program in Architectural Acoustics Engineering.

It is an intensive program that leads students to achieve advanced and very useful learning in their professional performance as an acoustic engineer. Therefore, this academic itinerary will allow you to delve into the most notorious advances in acoustic insulation, constructive technical solutions, sound absorption in enclosed spaces or vibrations. Likewise, thanks to the *Relearning*system, based on the reiteration of essential content, students will be able to reduce the long hours of study and memorization.

Professionals thus have a unique opportunity to progress in their careers through an academic option that is characterized by its flexible methodology and ease of access to its content. Students only need an electronic device with an Internet connection to view, at any time of the day, the content hosted on the virtual platform.

This **Postgraduate Diploma in Architectural Acoustics Engineering** contains the most complete and up-to-date program on the market. The most important features include:

- Development of case studies presented by experts in Acoustics engineering
- The graphic, schematic and eminently practical contents with which it is conceived provide technical and practical information on those disciplines that are essential for professional practice
- Practical exercises where the self-assessment process can be carried out to improve learning
- Its special emphasis on innovative methodologies
- Theoretical lessons, questions to the expert, debate forums on controversial topics, and individual reflection work
- Content that is accessible from any fixed or portable device with an Internet connection

Enroll now in the top-rated university in the world by its students according to the Trustpilot platform (4.9/5)"

Extend the information on this university program even further through the numerous educational resources offered by TECH"

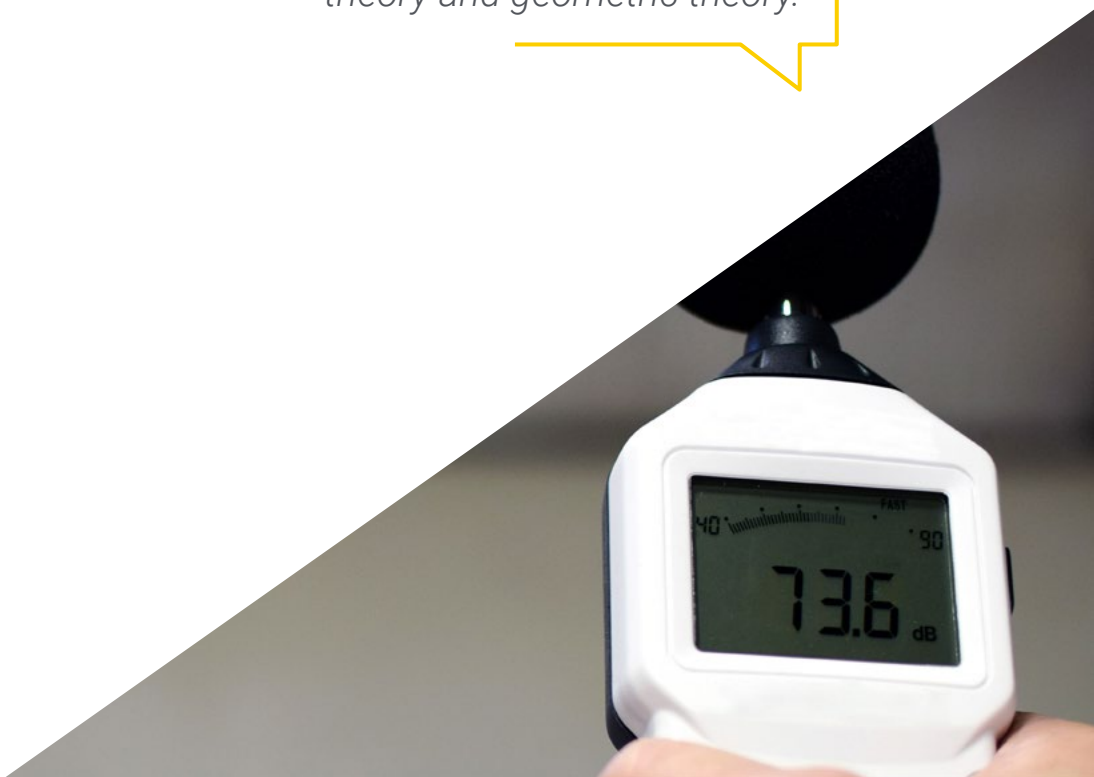
Get a solid learning about the physical principles that are part of the acoustic behavior.

You will analyze with the best didactic materials the sound fields in rooms by means of wave theory, statistical theory and geometric theory.

The program's teaching staff includes professionals from the sector who bring to this program the experience of their work, in addition to recognized specialists from prestigious reference societies and universities.

Its multimedia content, developed with the latest educational technology, will allow the professional a situated and contextual learning, that is, a simulated environment that will provide an immersive training programmed to train in real situations.

The design of this program focuses on Problem-Based Learning, in which the professional will have to try to solve the different professional practice situations that will arise throughout the academic course. For this purpose, the student will be assisted by an innovative interactive video system created by renowned experts.



02

Objectives

This university program has been designed to provide the engineering professional with the abilities and skills necessary to design acoustic insulation in rooms, buildings and various spaces of common use. For this purpose, TECH provides a theoretical syllabus with practical application, based on the highest scientific rigor and the latest trends in this field. A unique opportunity for professional growth through a 100% online academic option.

With this program you will have the skills to carry out the calculation of sound absorption, TR or the critical distance of a room"

General Objectives

- Develop the laws of physical acoustics that explain the behavior of sound waves such as the acoustic wave equation
- Develop the necessary knowledge on the handling of the essential concepts of sound generation and propagation in fluid media and the models that describe the behavior of sound waves in these media, both in their free propagation and in their interaction with matter from the formal and mathematical point of view
- Determine the nature and peculiarities of the acoustic elements of a system
- Familiarize the student with the terminology and analytical methods to solve acoustic problems
- Analyze the nature of sound sources and human perception
- Conceptualize noise and sound within sound reception
- Distinguish the particularities that affect the psychoacoustic perception of sounds
- Identify and specify the indexes and units of measurement necessary to quantify sound and its effects on sound propagation
- Compile the different acoustic measurement systems and their operating characteristics
- Provide a rationale for the correct use of the appropriate instruments for a specific measurement
- Delve into the methods and tools of digital treatment to obtain acoustic parameters
- Evaluate the different acoustic parameters by means of digital signal processing systems
- Establish the correct criteria for acoustic data acquisition through quantification and sampling
- Provide a solid understanding of the fundamentals and key concepts related to audio recording and the instrumentation used in recording studios
- Promote up-to-date knowledge of the constantly evolving technology in the field of audio recording and associated instrumentation
- Determine the protocols for handling advanced recording equipment and their application in practical acoustical engineering situations
- Analyze and classify the main sources of environmental noise and their consequences
- Measure environmental noise using appropriate acoustic indicators

Delve from the comfort of your home into acoustic characterization and the elements to consider in room design”

Specific Objectives

Module 1. Engineering Physics Acoustics

- Specify concepts related to the propagation of sound waves, 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 the building and the environment
- Analyze behaviors such as reflection, refraction, absorption, transmission, radiation and diffraction of sound

Module 2. 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 3. Acoustic Insulation

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

03

Course Management

This academic institution maintains a philosophy based on the excellence and quality of the contents of the programs. For this reason, a rigorous process of each and every one of the teachers who teach the programs is carried out. In this way, students will have the guarantee of accessing a Postgraduate Diploma developed by a great team of professionals with extensive experience in Architectural Acoustics Engineering projects for national and international companies.

Increase your knowledge of Acoustics Engineering through the best professionals and researchers in this field"

Management

Mr. Espinosa Corbellini, Daniel

- Expert Consultant in Audio Equipment and Room Acoustics
- Professor at the School of Engineering of Puerto Real from the University of Cadiz
- Design Engineer at Coelan Electrical Installations Company
- Audio Technician in Sales and Installations in the Daniel Sonido company
- Industrial Technical Engineer in Industrial Electronics at the University of Cadiz
- Industrial Engineer in Industrial Organization by the University of Cadiz
- Official Master's Degree in Evaluation and Management of Noise Pollution by the University of Cadiz
- Official Master's Degree in Acoustic Engineering from the University of Cadiz and the University of Granada
- Diploma of Advanced Studies by 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 at the University of Granada
- Professor in Degree in Architectural Studies at the School of Architecture at the University of Granada
- Professor in Physics Degree, at University of Granada
- Professor in Chemical Engineering Degree at the School of Civil Engineering of Roads, Canals and Ports at the University of Granada
- Professor in Telecommunication Technologies Engineering Degree at the School of Civil Engineering of Roads, Canals and Ports at the University of Granada
- Andrés Lara Prize 2019 to the young acoustics researcher awarded by the Spanish Society of Acoustics
- PhD in the Civil Engineering Program at the University of Granada
- Degree in Technical Architecture from the University of Granada
- Degree in Building 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
- University Master's Degree in Compulsory Secondary and High School Education, Vocational Training and Language Teaching Specialization in Technology, Computer Science and Industrial Processes

04

Structure and Content

This university program has been designed to provide the engineering professional with the abilities and skills necessary to design acoustic insulation in rooms, buildings and various spaces of common use. For this purpose, TECH provides a theoretical syllabus with practical application, based on the highest scientific rigor and the latest trends in this field. A unique opportunity for professional growth through a 100% online academic option.

Thanks to the Relearning methodology you will be able to reduce the long hours of study"

Module 1. Engineering Physics Acoustics

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 Wave 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 Clamped 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. Dissemination
- 1.8.2. Refraction Effect of Temperature
- 1.8.3. Diffraction. Edge or Grating Effect

1.9. Standing Waves: Tubes, 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. Room Acoustics

2.1. Distinction of Acoustic Insulation in Architecture
- 2.1.1. Distinction Between Acoustic Insulation and Acoustic Treatment. Improvement of Acoustic Comfort
- 2.1.2. Transmission Energy Balance. Incident Sound Power, Absorbed and Transmitted
- 2.1.3. Sound Insulation of Enclosures. Sound Transmission Index

2.2. Transmission of Sound
- 2.2.1. Noise Transmission Typology. Airborne Noise and Direct and Flanking
- 2.2.2. Propagation Mechanisms. Reflection, Refraction, Absorption and Diffraction
- 2.2.3. Sound Reflection and Absorption Rates
- 2.2.4. Sound Transmission Paths Between Two Contiguous Enclosures

2.3. Sound Insulation Performance Parameters of Buildings
- 2.3.1. Apparent Sound Reduction Index, R'
- 2.3.2. Standardized Difference of Level, DnT
- 2.3.3. Standardized Level difference, Dn

2.4. Quantities for Describing the Sound Insulation Performance of the Elements
- 2.4.1. Sound Reduction Index, RSound Reduction Index, R
- 2.4.2. Acoustic Reduction Improvement Index, ΔR
- 2.4.3. Normalized Difference in the Level of an Element, Dn,e

2.5. Airborne Sound Insulation Between Enclosures
- 2.5.1. Statement of the Problem
- 2.5.2. Calculation Model
- 2.5.3. Measurement Indexes
- 2.5.4. Constructive Technical Solutions

2.6. Impact Sound Insulation Between Enclosures
- 2.6.1. Statement of the Problem
- 2.6.2. Calculation Model
- 2.6.3. Measurement Indexes
- 2.6.4. Constructive Technical Solutions

2.7. Airborne Sound Insulation Against Exterior Noise
- 2.7.1. Statement of the Problem
- 2.7.2. Calculation Model
- 2.7.3. Measurement Indexes
- 2.7.4. Constructive Technical Solutions

2.8. Analysis of Indoor to Outdoor Noise Transmission
- 2.8.1. Statement of the Problem
- 2.8.2. Calculation Model
- 2.8.3. Measurement Indexes
- 2.8.4. Constructive Technical Solutions

2.9. Analysis of Noise Levels Produced by the Equipment of Installations and Machinery
- 2.9.1. Statement of the Problem
- 2.9.2. Analysis of Sound Transmission Through the Installations
- 2.9.3. Measurement Indexes

2.10. Sound Absorption in Enclosed Spaces
- 2.10.1. Total Equivalent Absorption Area
- 2.10.2. Analysis of Spaces with Irregular Distribution of Absorption
- 2.10.3. Analysis of Irregularly Shaped Spaces

Module 3. Acoustic Insulation

3.1. Acoustic Characterization in Enclosures
- 3.1.1. Sound Propagation in Free Space
- 3.1.2. Sound Propagation in an Enclosure. Reflected Sound
- 3.1.3. Theories of Room Acoustics: Wavelet, Statistical and Geometrical Theory

3.2. Analysis of Wavelet Theory (f≤fs)
- 3.2.1. Modal Problems of a Room Derived from the Acoustical Wave Equation
- 3.2.2. Axial, Tangential and Oblique Modes
  - 3.2.2.1. Three-Dimensional Equation and Modal Reinforcement Characteristics of Different Types of Modes
- 3.2.3. Modal Density. Schroeder Frequency. Spectral Curve of Application of Theories

3.3. Modal Distribution Criteria
- 3.3.1. Aurean Measures
  - 3.3.1.1. Other Posterior Measures (Bolt, Septmeyer, Louden, Boner, Sabine)
- 3.3.2. Walker and Bonello Criterion
- 3.3.3. Bolt Diagram

3.4. Statistical Theory Analysis (fs≤f≤4fs)
- 3.4.1. Homogeneous Diffusion Criterion. Sound Temporal Energy Balance
- 3.4.2. Direct and Reverberant Field. Critical Distance and Room Constant
- 3.4.3. TR. Sabine Calculation. Energy Decay Curve (ETC curve)
- 3.4.4. Optimal Reverberation Time. Beranek Tables

3.5. Geometric Theory Analysis (f≥4fs)
- 3.5.1. Specular and Non-specular Reflection. Application of Snell's Law for f≥4fs. geometry Theory Analysis (f≥ 4fs)
- 3.5.2. First-order Reflections. Echogram
- 3.5.3. Floating Echo

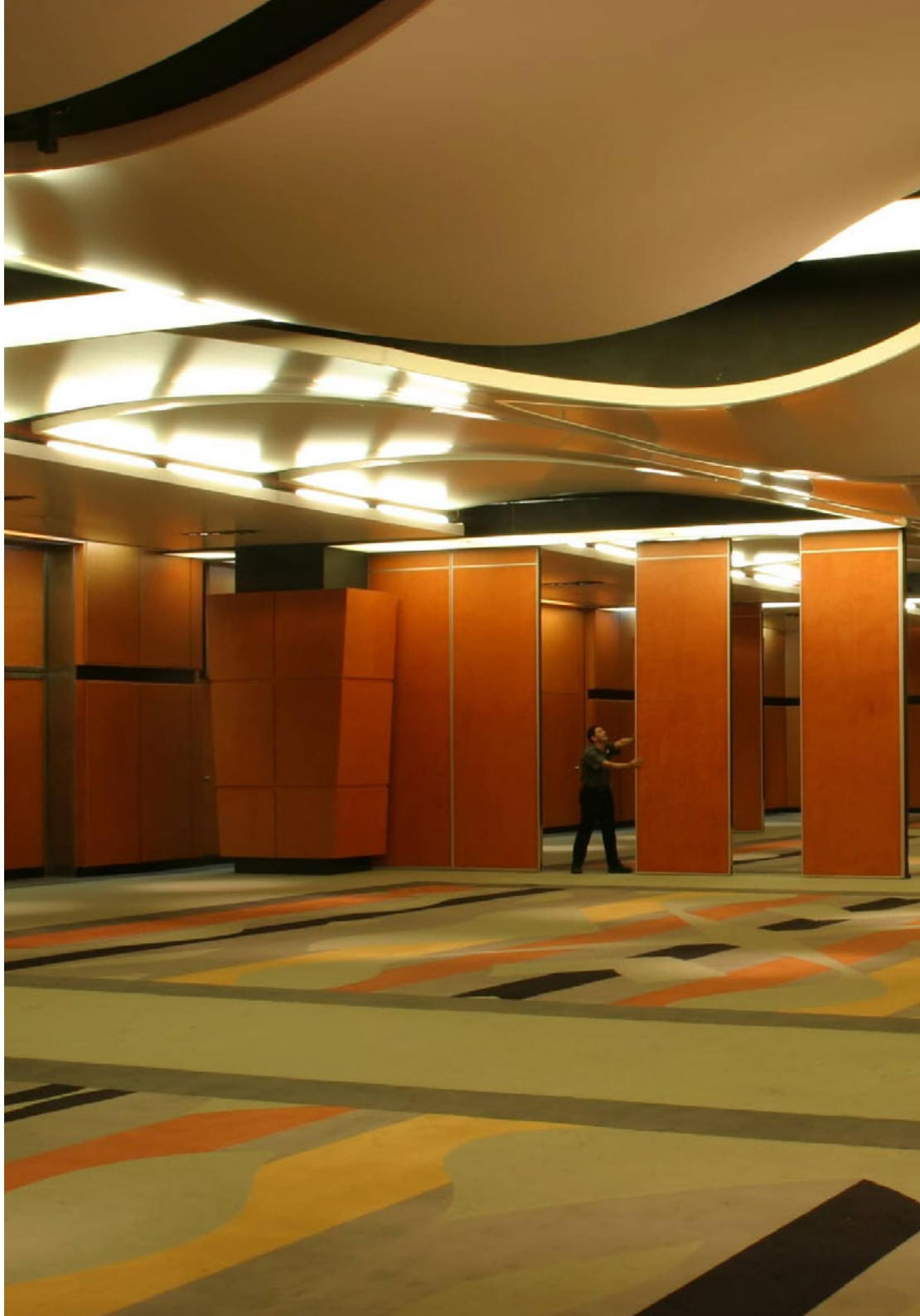
3.6. Materials for Acoustic Conditioning. Absorption
- 3.6.1. Absorption of Membranes and Fibers. Porous Materials
- 3.6.2. Acoustic Reduction Coefficient NRC
- 3.6.3. Variation of Absorption as a Function of Material Characteristics (Thickness, Porosity, Density, etc.)

3.7. Parameters for the evaluation of the acoustic quality in enclosures
- 3.7.1. Energetic Parameters (G, C50, C80, ITDG)
- 3.7.2. Reverberation Parameters (TR, EDT, BR, Br)
- 3.7.3. Spatiality Parameters (IACCE, IACCL, LG, LFE, LFCE)

3.8. Room Acoustic Design Procedures and Considerations
- 3.8.1. Reduction of Direct Sound Attenuation from Room Shape
- 3.8.2. Analysis of Room Shape in Relation to Reflections
- 3.8.3. Prediction of the Noise Level in a Room

3.9. Acoustic Diffusers
- 3.9.1. Polycylindrical Diffusers
- 3.9.2. Maximum Sequence Length (MLS) Schroeder Diffusers
- 3.9.3. Quadratic Residual Schroeder Diffusers (QRD)
  - 3.9.3.1. One-dimensional QRD Diffusers
  - 3.9.3.2. Two-dimensional QRD Diffusers
  - 3.9.3.3. Primitive Root Schroeder Diffusers (PRD)

3.10. Variable Acoustics in Multifunctional Spaces. Elements for its Design
- 3.10.1. Design of Variable Acoustic Spaces from Variable Physical Elements
- 3.10.2. Design of Variable Acoustic Spaces from Electronic Systems
- 3.10.3. Comparative Analysis of the Use of Physical Elements vs. Electronic Systems



Advance your professional career as an expert engineer in Architectural Acoustic Engineering thanks to TECH, the world's largest digital university"

05

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

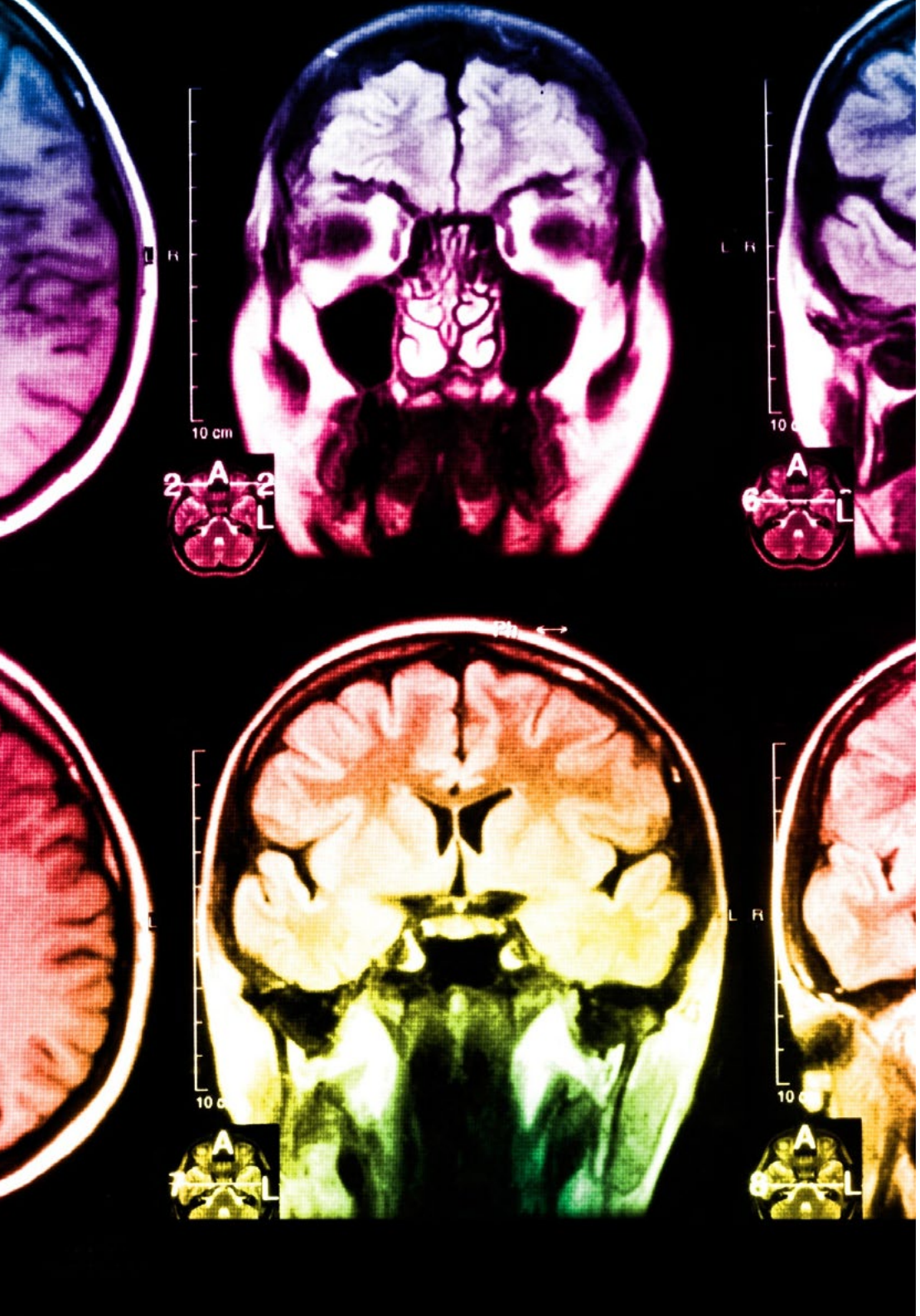
TECH effectively combines the Case Study methodology with a 100% online learning system based on repetition, which combines 8 different teaching elements in each lesson.

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.

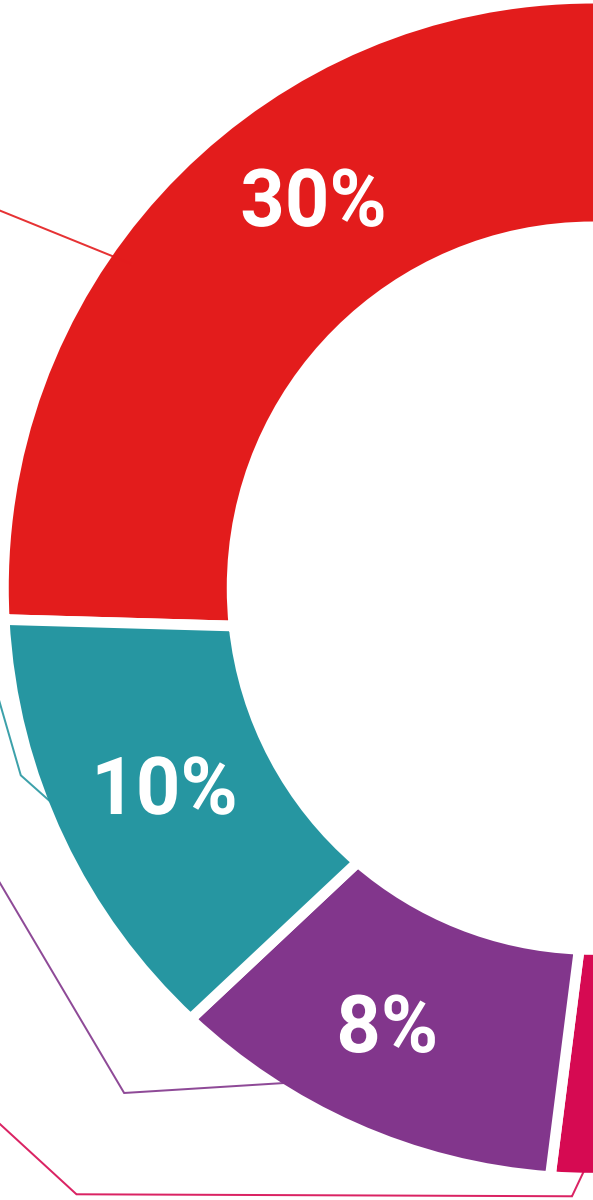
Learning from an Expert strengthens knowledge and memory, and generates confidence in future difficult decisions.

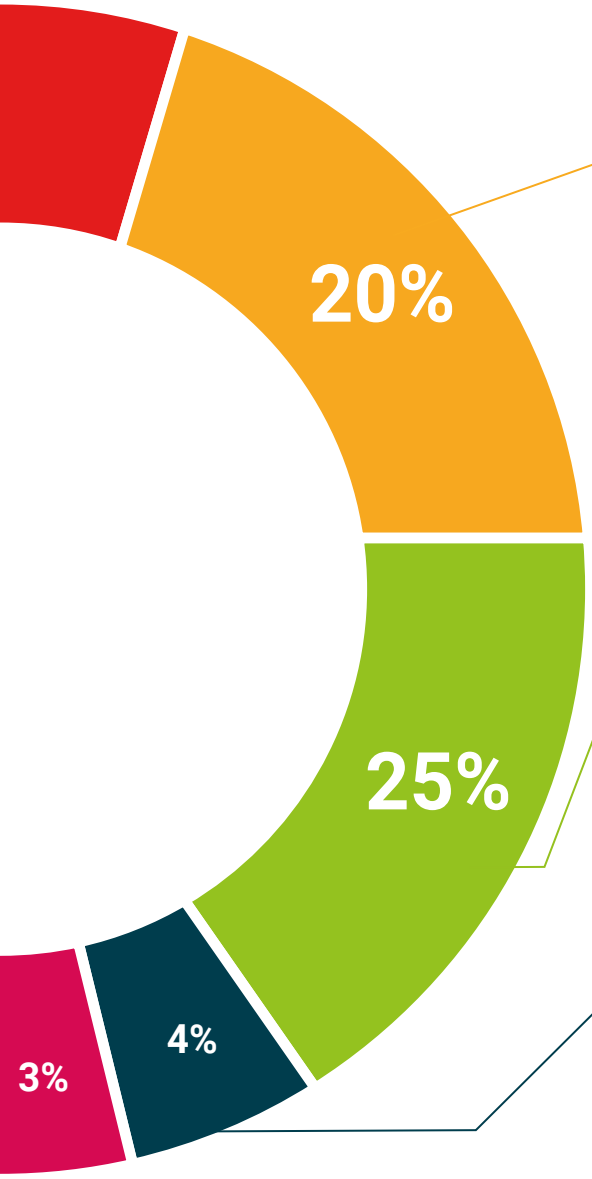
Practising Skills and Abilities

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.

06

Certificate

The Postgraduate Diploma in Architectural Acoustics Engineering guarantees students, in addition to the most rigorous and up-to-date education, access to a Postgraduate Diploma issued by TECH Technological University.

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

This **Postgraduate Diploma in Architectural Acoustics Engineering** contains the most complete and up-to-date program on the market.

After the student has passed the assessments, they will receive their corresponding **Postgraduate Diploma** issued by **TECH Technological University** via tracked delivery*.

The certificate issued by **TECH Technological University** will reflect the qualification obtained in the Postgraduate Diploma, and meets the requirements commonly demanded by labor exchanges, competitive examinations, and professional career evaluation committees.

Title: **Postgraduate Diploma in Architectural Acoustics Engineering**

Official Nº of Hours: **450 h.**


tech technological university

Awards the following

CERTIFICATE

to

Mr./Ms. _____, with identification number _____.

For having passed and accredited the following program

POSTGRADUATE DIPLOMA

in

Architectural Acoustics Engineering

This is a qualification awarded by this University, equivalent to 450 hours, with a start date of dd/mm/yyyy and an end date of dd/mm/yyyy.

TECH is a Private Institution of Higher Education recognized by the Ministry of Public Education as of June 28, 2018.

June 17, 2020

Tere Guevara Navarro
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

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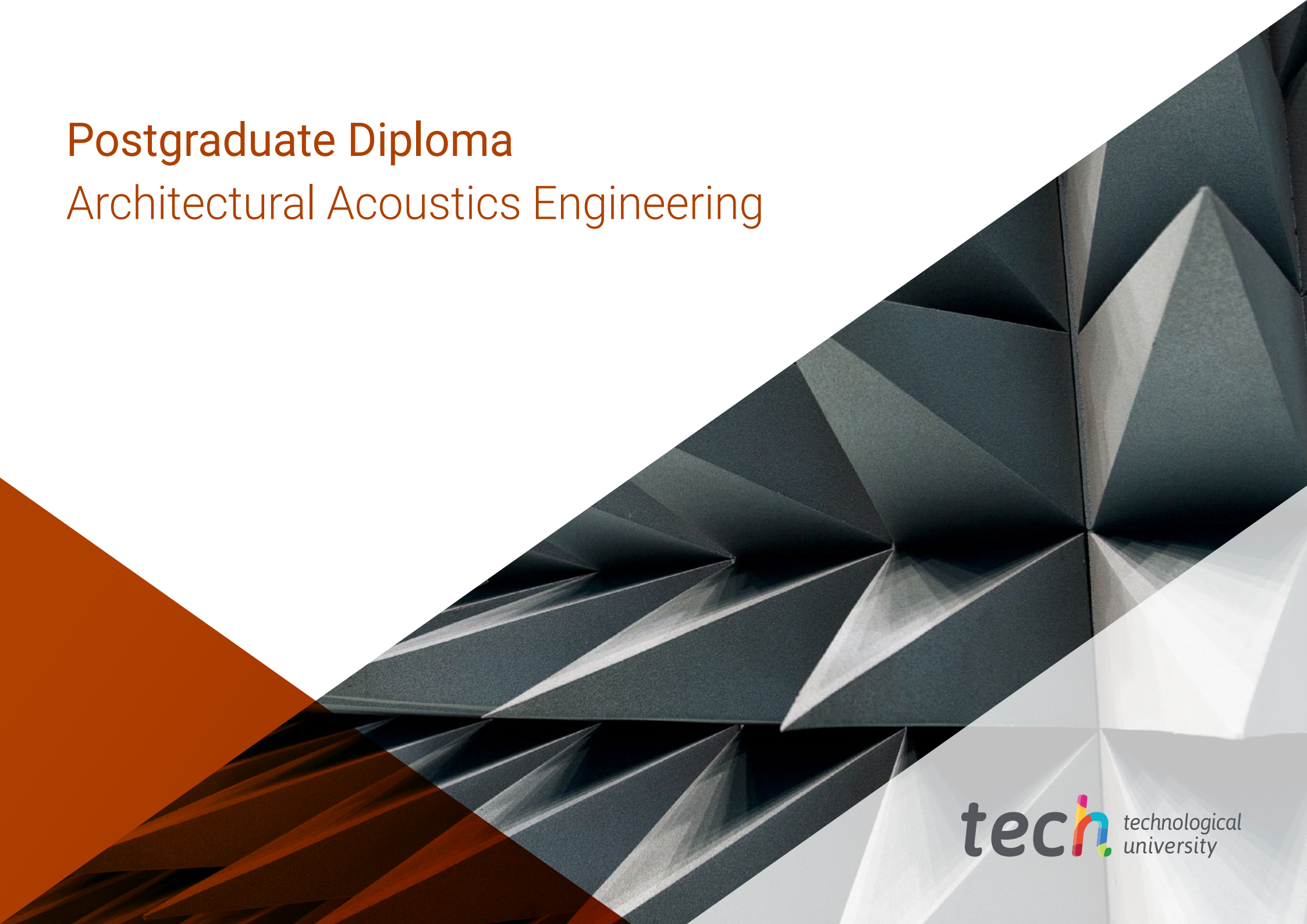

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