

# Postgraduate Certificate

## Acoustic Insulation in Building Construction



## Postgraduate Certificate Acoustic Insulation in Building Construction

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

Website: [www.techtute.com/in/engineering/postgraduate-certificate/acoustic-insulation-building-construction](http://www.techtute.com/in/engineering/postgraduate-certificate/acoustic-insulation-building-construction)

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# 01

# Introduction

In an increasingly urbanized world, the quality of the sound environment has become a critical factor influencing everyone's life. Noise and noise pollution are omnipresent in modern society, which has generated the need to understand and effectively address sound insulation in the field of architecture. In this context, this academic program offers the opportunity to explore the fundamental principles of Acoustics and its application in construction. Moreover, being 100% online, it offers flexibility of schedules, allowing professionals to access and take full advantage of everything from reading specialized texts to participating in forums. Guiding in an accurate and very experiential way the development of the topics.



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*Discover how to design spaces where  
silence and harmony are the key, with  
this Postgraduate Certificate in Acoustic  
Insulation in Building Construction”*

Sound Insulation Engineering in buildings plays an essential role in the creation of ideal sound environments in a world increasingly influenced by noise. Understanding the propagation and impact of sound in enclosed spaces, as well as mastering the theories and techniques for its control, is imperative in today's society. This academic program focuses on providing a comprehensive understanding of this discipline.

This syllabus is characterized by its focus and innovative teaching methodology based on the Relearning method and the use of tools such as Storytelling. This allows students the opportunity to assimilate and effectively apply the guidelines provided during the learning process. In this way they acquire a solid knowledge, ranging from sound propagation in enclosures to implementation in the design of environments. As a result, they will be prepared to contribute in spaces that comply with insulation standards, achieving ideal environments.

This academic offer not only guarantees a high quality education in this discipline, but also cultivates practical skills that are highly valued in the construction and acoustic engineering industries. In this way, students achieve essential skills to contribute to the design and construction of spaces with an optimal sound balance, promoting more comfortable and functional environments.

This **Postgraduate Certificate in Acoustic Insulation in Building Construction** contains the most complete and up-to-date educational program on the market. The most important features include:

- ♦ The development of practical cases presented by experts in Acoustic Insulation in Building Construction
- ♦ The graphic, schematic, and practical contents with which they are created, provide scientific and practical information on the disciplines that are essential for professional practice
- ♦ The practical exercises where the self-evaluation 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 assignments
- ♦ Content that is accessible from any fixed or portable device with an Internet connection



*Explore the the theories behind sound and become an expert in creating ideal sound environments with this cutting-edge academic program”*

“

*Learn how to calculate acoustic modes and the skill of acoustic absorption in an innovative learning environment”*

The program includes in its teaching staff professionals of the field who pour into this training the experience of their work, in addition to recognized specialists from reference societies and prestigious 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.

*TECH offers you the flexibility to study from anywhere, without compromising the quality of your learning in acoustic engineering.*

*Get ready to lead acoustic design projects and contribute to the creation of comfortable spaces with the guidance of the best experts in Acoustic Insulation.*



# 02

# Objectives

This Postgraduate Certificate focuses on comprehensive learning in the field of acoustics, with objectives that address essential aspects that allow students to accurately characterize the propagation of sound both outdoors and in enclosed spaces, understanding the problems associated with wave confinement. Additionally, an in-depth analysis of the use of different acoustic theories of the frequency spectrum is promoted, allowing professionals to evaluate when and how to apply each theoretical approach in practical situations.





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*Explore the waves of knowledge  
in this unique academic syllabus,  
where theory allows for the  
creation of balanced spaces”*



## General Objectives

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- ♦ Characterize the propagation of sound in the open air and in enclosed spaces and the problems generated by the confinement of sound in enclosures
- ♦ Analyze the use of different acoustic theories according to the frequency spectrum
- ♦ Examine the phenomena of sound absorption and diffusion and the design of acoustic corrective elements
- ♦ Design acoustic corrective elements such as diffusers and know the acoustic parameters that define sound quality in enclosed spaces





## Specific Objectives

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- 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



*Enter the world of acoustics and discover how to shape sound. Start this journey towards professional excellence"*

# 03

# Course Management

The instructors leading this Postgraduate Certificate are recognized for their excellence and extensive experience in Acoustic Engineering and have a deep understanding of the essential fundamentals and practical application in a demanding professional environment. Additionally, they are committed to providing students with a quality education. Their preparation ranges from sound characterization to understanding the complex theories of room acoustics, which brings to this program a critical and up-to-date view of the technological challenges of this field.





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*The best experts are at TECH and will guide you to excellence in engineering in acoustic insulation”*

## Management



### D. 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 of Chemical Engineering of Roads, Canals and Ports at the School of Civil Engineering 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

The focus of this syllabus delves into the fundamentals of modern acoustics, beginning with the characterization of enclosures and exploring the propagation of sound in open and closed spaces. It also delves into the theories of room acoustics, such as wave and statistical acoustics, the absorption of acoustic materials and their variables in multifunctional spaces. This provides solid knowledge in the application of the principles and practices of this area. For this purpose, the graduate has at their disposal pedagogical resources such as specialized readings, case studies or multimedia pills.







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*The team of teaching experts will accompany you on the road to mastering Engineering in Building Construction Acoustics. Your future will sound better than ever”*

## Module 1. Acoustic Insulation

- 1.1. Acoustic Characterization in Enclosures
  - 1.1.1. Sound Propagation in Free Space
  - 1.1.2. Sound Propagation in an Enclosure. Reflected Sound
  - 1.1.3. Theories of Room Acoustics: Wavelet, Statistical and Geometrical Theory
- 1.2. Analysis of Wavelet Theory ( $f \leq f_s$ )
  - 1.2.1. Modal Problems of a Room Derived from the Acoustical Wave Equation
  - 1.2.2. Axial, Tangential and Oblique Modes
    - 1.2.2.1. Three-Dimensional Equation and Modal Reinforcement Characteristics of Different Types of Modes
  - 1.2.3. Modal Density. Schroeder Frequency. Spectral Curve of Application of Theories
- 1.3. Modal Distribution Criteria
  - 1.3.1. Aurrean Measures
    - 1.3.1.1. Other Posterior Measures (Bolt, Septmeyer, Louden, Boner, Sabine)
  - 1.3.2. Walker and Bonello Criterion
  - 1.3.3. Bolt's Diagram
- 1.4. Statistical Theory Analysis ( $f_s \leq f \leq 4f_s$ )
  - 1.4.1. Homogeneous Diffusion Criterion. Sound Temporal Energy Balance
  - 1.4.2. Direct and Reverberant Field. Critical Distance and Room Constant
  - 1.4.3. TR. Sabine Calculation. Energy Decay Curve (ETC curve)
  - 1.4.4. Optimal Reverberation Time. Beranek Tables
- 1.5. Geometric Theory Analysis ( $f \geq 4f_s$ )
  - 1.5.1. Specular and Non-specular Reflection. Application of Snell's Law for  $f \geq 4f_s$ . geometry Theory Analysis ( $f \geq 4f_s$ )
  - 1.5.2. First-order Reflections. Echogram
  - 1.5.3. Floating Echo
- 1.6. Materials for Acoustic Conditioning. Absorption
  - 1.6.1. Absorption of Membranes and Fibers. Porous Materials
  - 1.6.2. Acoustic Reduction Coefficient NRC
  - 1.6.3. Variation of Absorption as a Function of Material Characteristics (Thickness, Porosity, Density, etc.)





- 1.7. Parameters for the evaluation of the acoustic quality in enclosures
  - 1.7.1. Energetic Parameters (G, C50, C80, ITDG)
  - 1.7.2. Reverberation Parameters (TR, EDT, BR, Br)
  - 1.7.3. Spatiality Parameters (IACCE, IACCL, LG, LFE, LFCE)
- 1.8. Room Acoustic Design Procedures and Considerations
  - 1.8.1. Reduction of Direct Sound Attenuation from Room Shape
  - 1.8.2. Analysis of Room Shape in Relation to Reflections
  - 1.8.3. Prediction of the Noise Level in a Room
- 1.9. Acoustic Diffusers
  - 1.9.1. Polycylindrical Diffusers
  - 1.9.2. Maximum Sequence Length (MLS) Schroeder Diffusers
  - 1.9.3. Quadratic Residual Schroeder Diffusers (QRD)
    - 1.9.3.1. One-dimensional QRD Diffusers
    - 1.9.3.2. Two-dimensional QRD Diffusers
    - 1.9.3.3. Primitive Root Schroeder Diffusers (PRD)
- 1.10. Variable Acoustics in Multifunctional Spaces. Elements for its Design
  - 1.10.1. Design of Variable Acoustic Spaces from Variable Physical Elements
  - 1.10.2. Design of Variable Acoustic Spaces from Electronic Systems
  - 1.10.3. Comparative Analysis of the Use of Physical Elements vs Electronic Systems



*Knowledge is the key to building acoustically perfect spaces. Join TECH and develop the best skills in this field”*

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.

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*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 Certificate in Acoustic Insulation in Building Construction Applied to Drones guarantees students, in addition to the most rigorous and up-to-date education, access to a Postgraduate Certificate issued by TECH Technological University.





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

This **Postgraduate Certificate in Acoustic Insulation in Building Construction** 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 Certificate** issued by **TECH Technological University** via tracked delivery\*.

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

Title: **Postgraduate Certificate in Acoustic Insulation in Building Construction**

Official N° of hours: **150 h.**



\*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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