PostgraduateCertificate

Acoustic Measurements and Advanced Instrumentation

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Postgraduate Certificate
Acoustic Measurements and Advanced Instrumentation

- Modality: **online**
- Duration: **12 weeks**
- Certificate: **TECH Global University**
- Credits: **12 ECTS**
- Schedule: **at your own pace**
- Exams: **online**

Website: **www.techtitute.com/us/engineering/postgraduate-certificate/acoustic-measurements-advanced-instrumentation**

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01

Introduction

Noise pollution is a growing problem in today's societies, with the development of large urban centers where large numbers of people are concentrated. This situation has a decisive influence on the health and well-being of city dwellers, who are exposed to noise from daily traffic or from construction work in such environments. In this context, experts in acoustic measurements are highly valued, as they are necessary to enforce the established regulations and legislation. Therefore, this 100% online program is presented as a great opportunity for all those professionals who wish to deepen their knowledge in aspects such as the technical design of resonance or acoustic impedance measurement.

Thanks to this unique 100% online program, you will be able to create new strategies and establish efficient Acoustic Measurements"

Research and development in the field of acoustics and instrumentation is constantly evolving. Engineers with up-to-date knowledge can contribute to technological innovation, which can lead to the creation of more advanced products and solutions.

In that sense, reducing noise and improving acoustic quality can contribute to the preservation of the environment and the well-being of communities. Therefore, engineers trained in this field will be able to play an important role in reducing noise pollution and creating healthier environments.

Precisely for this reason, TECH has created an exclusive and cutting-edge program for professionals to acquire skills in acoustic measurements and instrumentation. Additionally, the graduates of this program will be able to work in a variety of sectors, offering them job versatility that can be valuable throughout their careers.

To facilitate the integration of the latest industry knowledge, TECH has assembled a team of renowned experts in Acoustic Engineering. Therefore, a fully online program has been created based on the effective *Relearning*methodology. For this reason, the student will integrate the knowledge in a natural and progressive way from the comfort of wherever they chooses and only needing a device with Internet connection.

This **Postgraduate Certificate in Acoustic Measurements and Advanced Instrumentation** contains the most complete and up-to-date program on the market. The most important features include:

- The graphic, schematic, and practical contents with which they are created, provide practical information on the 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 assignments
- Content that is accessible from any fixed or portable device with an Internet connection

The best Postgraduate Certificate in Acoustic Measurements and Advanced Instrumentation in the current academic landscape"

Delve deeper into the transmission velocity, pressure and wavelength of sound with this unique online program"

Learn how to identify and reduce noise from sources to propagation in its purest and most complex form.

Enroll and guarantee your professional success in an ever-expanding industry.

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.

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Objectives

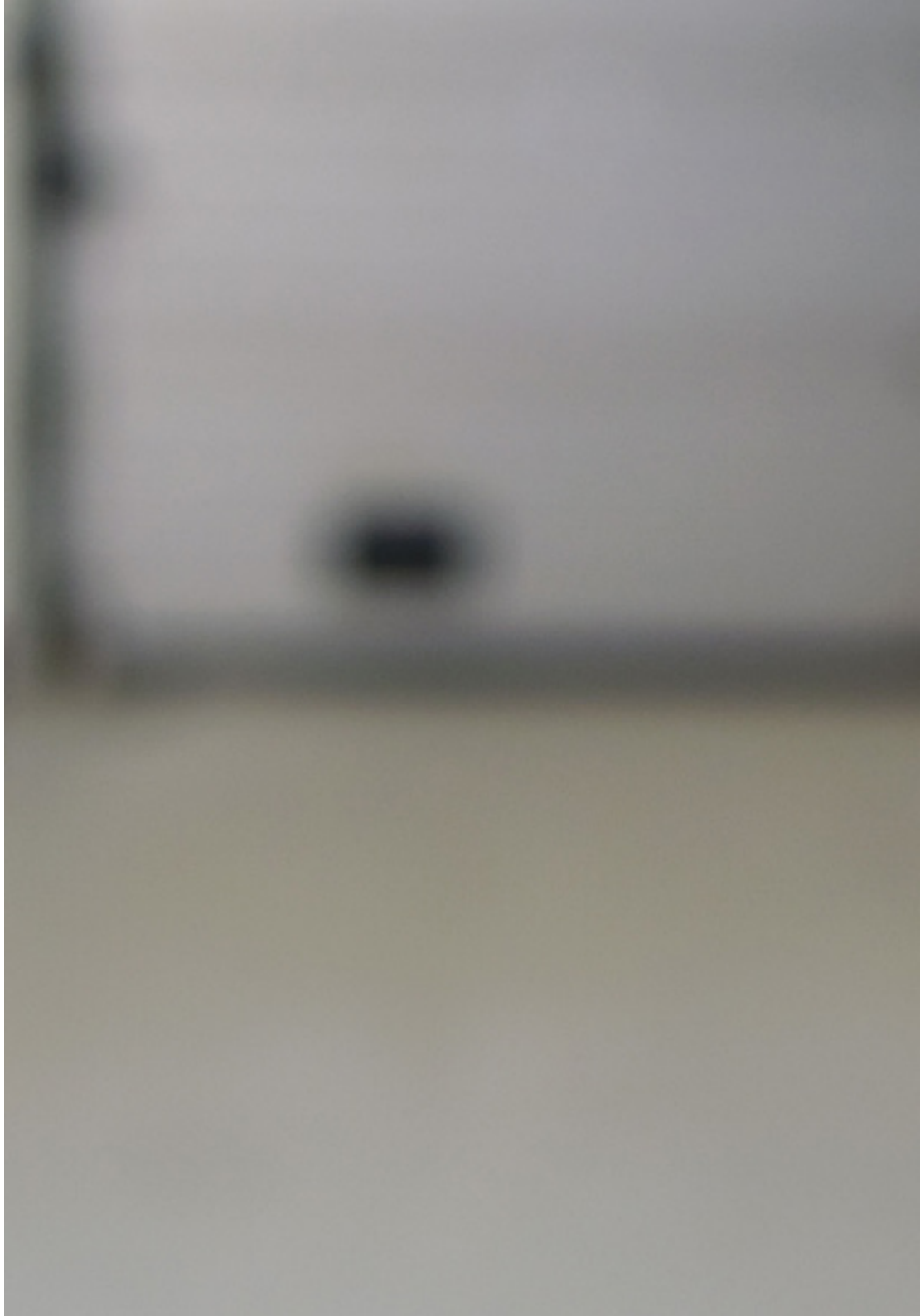
The main purpose of this program is to provide students with a thorough understanding of how sound is perceived and how to use the instrumentation necessary to perform high-precision acoustic measurements. Throughout this educational process, students will delve into the physical fundamentals of acoustics and develop crucial skills to accurately evaluate acoustic parameters, which will enable them to actively participate in the architectural and environmental fields. This program is set up as a solid pathway for students to become competent professionals capable of addressing real-world acoustical challenges.

Achieve your career goals with a cutting-edge program. Your success begins with TECH"

General Objectives

- 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
- Apply criteria of qualitative and quantitative acceptability of a noise
- Establish the various criteria or appropriate weightings to be applied in a given acoustic measurement
- 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

A unique, key, and decisive educational experience to boost your professional development"



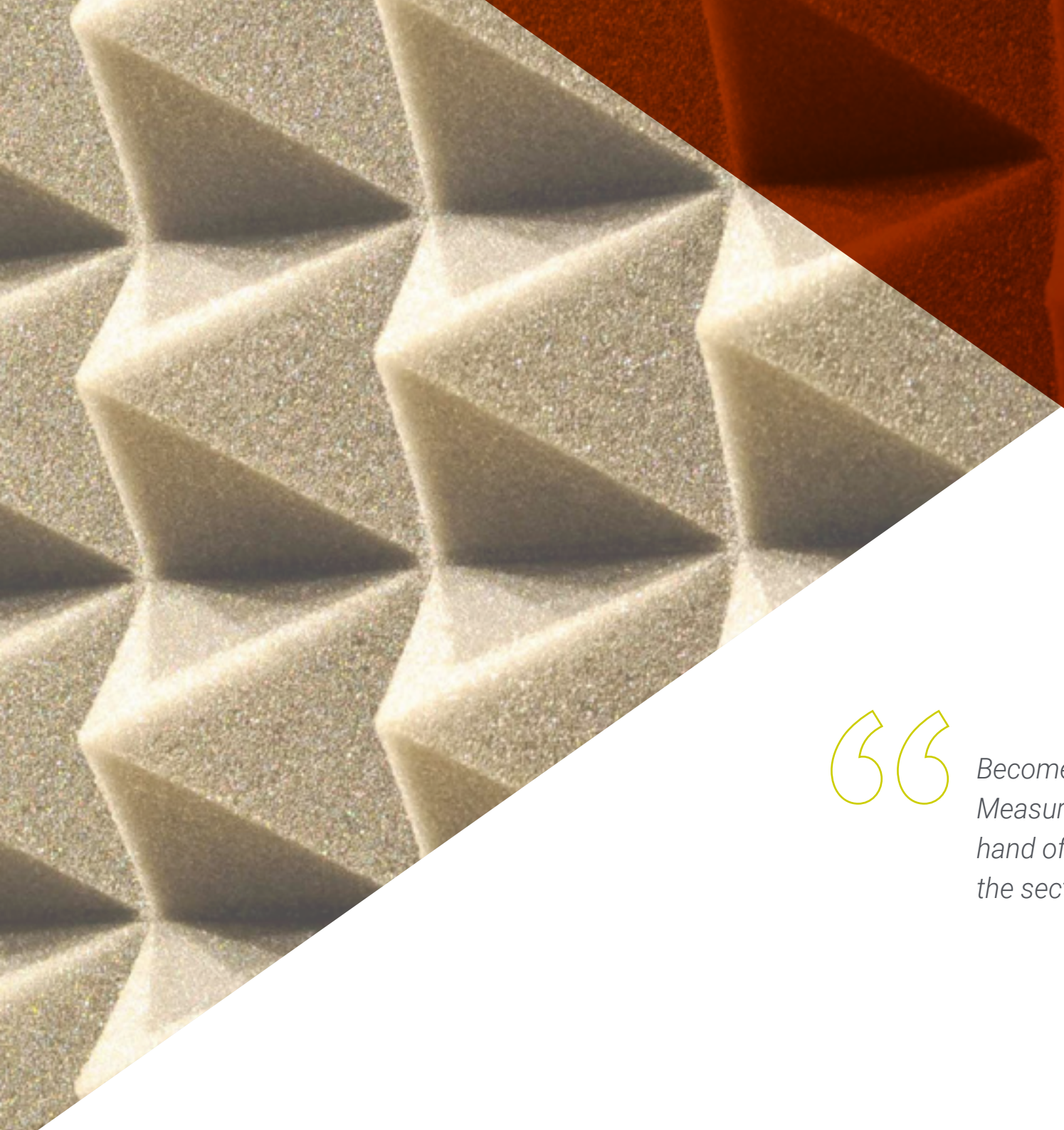
Specific Objectives

- 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 appropriate units and correlate them with each other using isophonic curves
- Evaluate the effects of frequency and temporal masking and its effect on perception
- 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
- Apply criteria of qualitative and quantitative acceptability of a noise
- Establish the various criteria or appropriate weightings to be applied in a given acoustic measurement
- 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 appropriate units and correlate them with each other using isophonic curves

03

Course Management

In order to offer an elite education to engineers, TECH has carefully selected a first class teaching team. This is a team of professionals with extensive work experience in Acoustic Engineering. Therefore, the student who enrolls will receive solid and cutting-edge knowledge in the field of Psychoacoustics and acoustic signal detection. All this in a 100% online way and through the most effective methodology of the current academic panorama, the *Relearning*.



Become an expert in Acoustic Measurements with TECH by the hand of the best professionals of the sector"

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

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. Cuervo Bernal, Ana Teresa

- Audiotec Technician
- Technician accredited by ENAC and the Government of Catalonia (ECPCA), for the realization of acoustic measurements in all fields
- Sound teacher at the Film School "Cine en Acción"
- Master's Degree in Architectural and Environmental Acoustics by the University of La Salle in Barcelona
- Graduate in Acoustic Engineering from the San Buenaventura University of Bogota
- Diploma in Art and Visual Communication from the San Buenaventura University of Bogota
- Diploma in Audiovisual Production by Cinema in Action Barcelona
- Diploma in Audiovisual Sound by Cine en Acción Barcelona

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

04

Structure and Content

The syllabus provided for this program has been developed by experts in Acoustic Engineering. Yes, 360 hours of the best theoretical, practical and additional contents have been included, presented in different audiovisual formats. Additionally, TECH brings its revolutionary *Relearning*methodology, allowing the student to get into Acoustic Measurements and Advanced Instrumentation and acquiring solid knowledge in a progressive and effective way.

A specific and dynamic syllabus that you can access 24 hours a day, with no time or geographical restrictions"

Module 1. Psychoacoustics and Acoustic Signal Detection

1.1. Noise Sources
- 1.1.1. Sound Transmission Rate, Pressure and Wavelength
- 1.1.2. Noise Background Noise
- 1.1.3. Omnidirectional Noise Source. Power and Sound Intensity
- 1.1.4. Acoustic Impedance for Plane Waves

1.2. Sound Measurement Levels
- 1.2.1. Weber-Fechner Law. The Decibel
- 1.2.2. Sound Pressure Level
- 1.2.3. Sound Intensity Level
- 1.2.4. Sound Power Level

1.3. Measurement of the Acoustic Field in Decibels (Db)
- 1.3.1. Sum of Different Levels
- 1.3.2. Sum of Equal Levels
- 1.3.3. Subtraction of Levels. Correction for Background Noise

1.4. Binaural Acoustics
- 1.4.1. Structure of the Aural Model
- 1.4.2. Range and Sound Pressure-Frequency Relationship
- 1.4.3. Detection Thresholds and Exposure Limits
- 1.4.4. Physical Model

1.5. Psychoacoustic and Physical Measurements
- 1.5.1. Loudness and Loudness Level. Phones
- 1.5.2. Pitch and Frequency. Timbre. Spectral Range
- 1.5.3. Equal Loudness Curves (Isophonic). Fletcher and Munson and Others

1.6. Acoustic Perceptual Properties
- 1.6.1. Sound Masking. Tones and Noise Bands
- 1.6.2. Temporal Masking. Pre and Post Masking
- 1.6.3. Frequency Selectivity of the Ear. Critical Bands
- 1.6.4. Non-linear Perceptual and Other Effects. Hass Effect and Doppler Effect

1.7. The Phonatory System
- 1.7.1. Mathematical Model of the Vocal Tract
- 1.7.2. Emission Times, Dominant Spectral Content and Emission Level
- 1.7.3. Directivity of the Vocal Emission. Polar Curve

1.8. Spectral Analysis and Frequency Bands
- 1.8.1. Frequency Weighting Curves A (dBA). Other Spectral Weightings
- 1.8.2. Spectral Analysis by Octaves and thirds of Octave. Octave Concept
- 1.8.3. Pink Noise and White Noise
- 1.8.4. Other Noise Bands Used in Signal Detection and Analysis

1.9. Atmospheric Attenuation of Sound in a Free Field
- 1.9.1. Attenuation Due to Temperature and Atmospheric Pressure Variation in the Speed of Sound
- 1.9.2. Air Absorption Effect
- 1.9.3. Attenuation Due to Height Above the Ground and Wind Velocity
- 1.9.4. Attenuation Due to Turbulence, Rain, Snow or Vegetation
- 1.9.5. Attenuation Due to Noise Barriers or Terrain Variation Due to Interference

1.10. Temporal Analysis and Acoustic Indices of Perceived Intelligibility
- 1.10.1. Subjective Perception of First Acoustic Reflections. Echo Zones
- 1.10.2. Floating Echo
- 1.10.3. Speech Intelligibility. Calculation of %ALCons and STI/RASTIIntelligibility of the Word

Module 2. Pumping Stations

2.1. Noise
- 2.1.1. Noise Descriptors by Energy Content Assessment.: LAeq, SEL
- 2.1.2. Noise Descriptors by Temporal Variation Assessment: LAnT
- 2.1.3. Noise Categorization Curves: NC, PNC, RC and NR

2.2. Pressure Measurement
- 2.2.1. Sound Level Meter. General Description, Structure and Operation by Blocks
- 2.2.2. Frequency Weighting Analysis. Networks A,C, Z
- 2.2.3. Temporal Weighting Analysis. Slow, Fast, Impulse Networks
- 2.2.4. Integrating Sound Level Meter and Dosimeter (Laeq and SEL). Classes and Types. Regulations
- 2.2.5. Phases of Metrological Control Regulations
- 2.2.6. Calipers and Pistophones

2.3. Intensity Measurement
- 2.3.1. Intensimetry. Properties and Applications
- 2.3.2. Intensimetric Probes
  - 2.3.2.1. Pressure/Pressure and pressure/Velocity Types
- 2.3.3. Calibration Methods. Uncertainties

2.4. Sources of Acoustic Excitation
- 2.4.1. Dodecahedral Omnidirectional Source. International Regulations
- 2.4.2. Airborne Impulsive Sources. Gun and Acoustic Balloons
- 2.4.3. Structural Impulsive Sources. Impact Machine

2.5. Vibration Measurement
- 2.5.1. Piezoelectric Accelerometers
- 2.5.2. Displacement, Velocity and Acceleration Curves
- 2.5.3. Vibration Analyzers. Frequency Weightings
- 2.5.4. Parameters and Calibration

2.6. Measuring Microphones
- 2.6.1. Types of Measuring Microphones
  - 2.6.1.1. The Condenser and Pre-polarized Microphone. Basis of Operation
- 2.6.2. Design and Construction of Microphones
  - 2.6.2.1. Diffuse Field, Random Field and Pressure Field
- 2.6.3. Sensitivity, Response, Directivity, Range and Stability
- 2.6.4. Environmental and Operator Influences. Measurement with Microphones

2.7. Acoustic Impedance Measurement
- 2.7.1. Impedance Tube Methods (Kundt): Standing Wave Range Method
- 2.7.2. Determination of Sound Absorption Coefficient at Normal Incidence ISO 10524-1:1001 Transfer Function Method
- 2.7.3. Surface Method: Impedance Gun

2.8. Acoustic Measuring Chambers
- 2.8.1. Anechoic Chamber. Design and Materials
- 2.8.2. Semi-Anechoic Chamber. Design and Materials
- 2.8.3. Reverberation Chamber. Design and Materials

2.9. Other Measurement Systems
- 2.9.1. Automatic and Autonomous Measurement Systems for Environmental Acoustics
- 2.9.2. Measurement Systems Using Data acquisition Cards and Software
- 2.9.3. Systems Based on Simulation Software

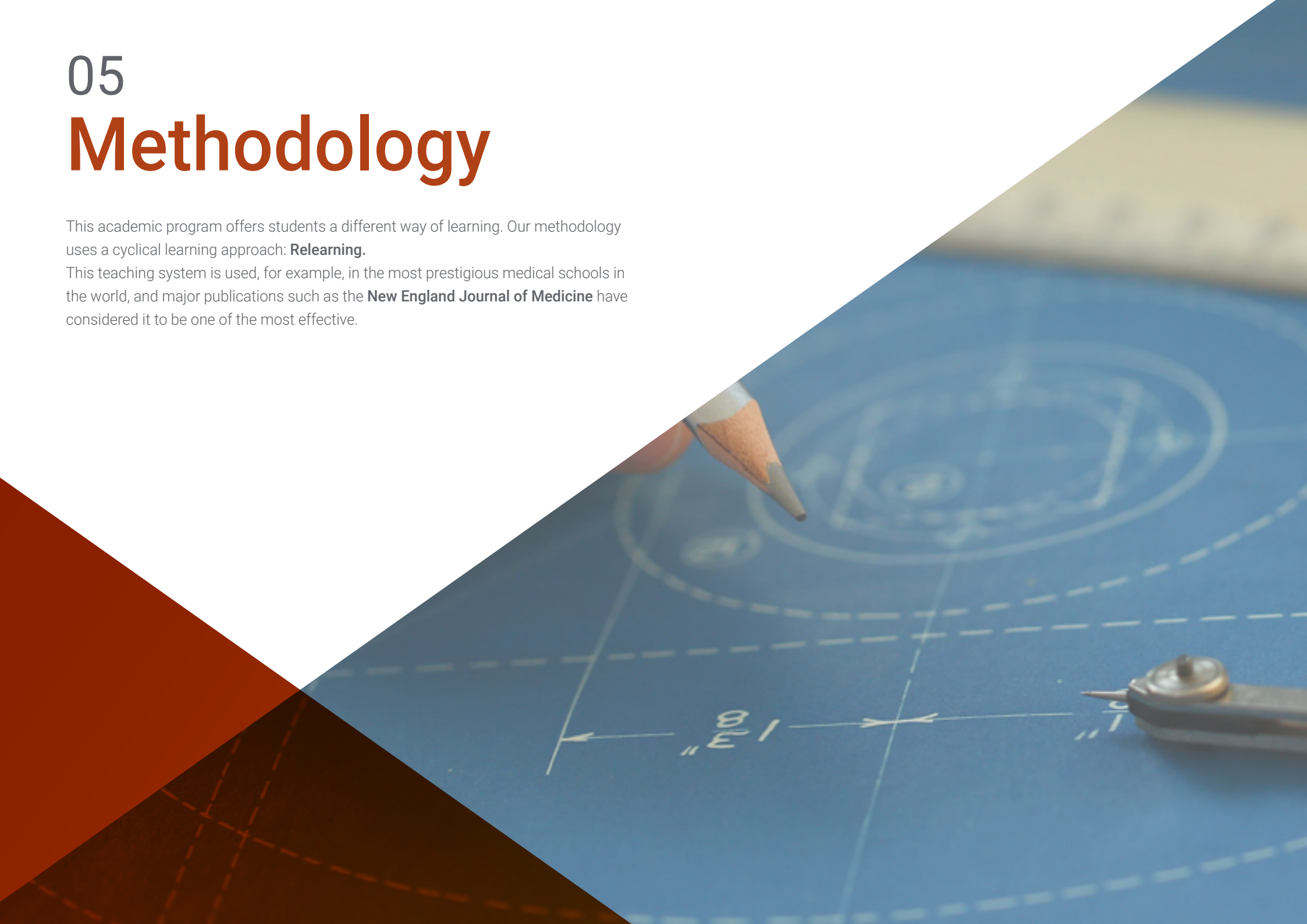
2.10. Uncertainty in Acoustic Measurement
- 2.10.1. Sources of Uncertainty
- 2.10.2. Reproducible and Non-Reproducible Measurements
- 2.10.3. Direct and Indirect Measurements

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.

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

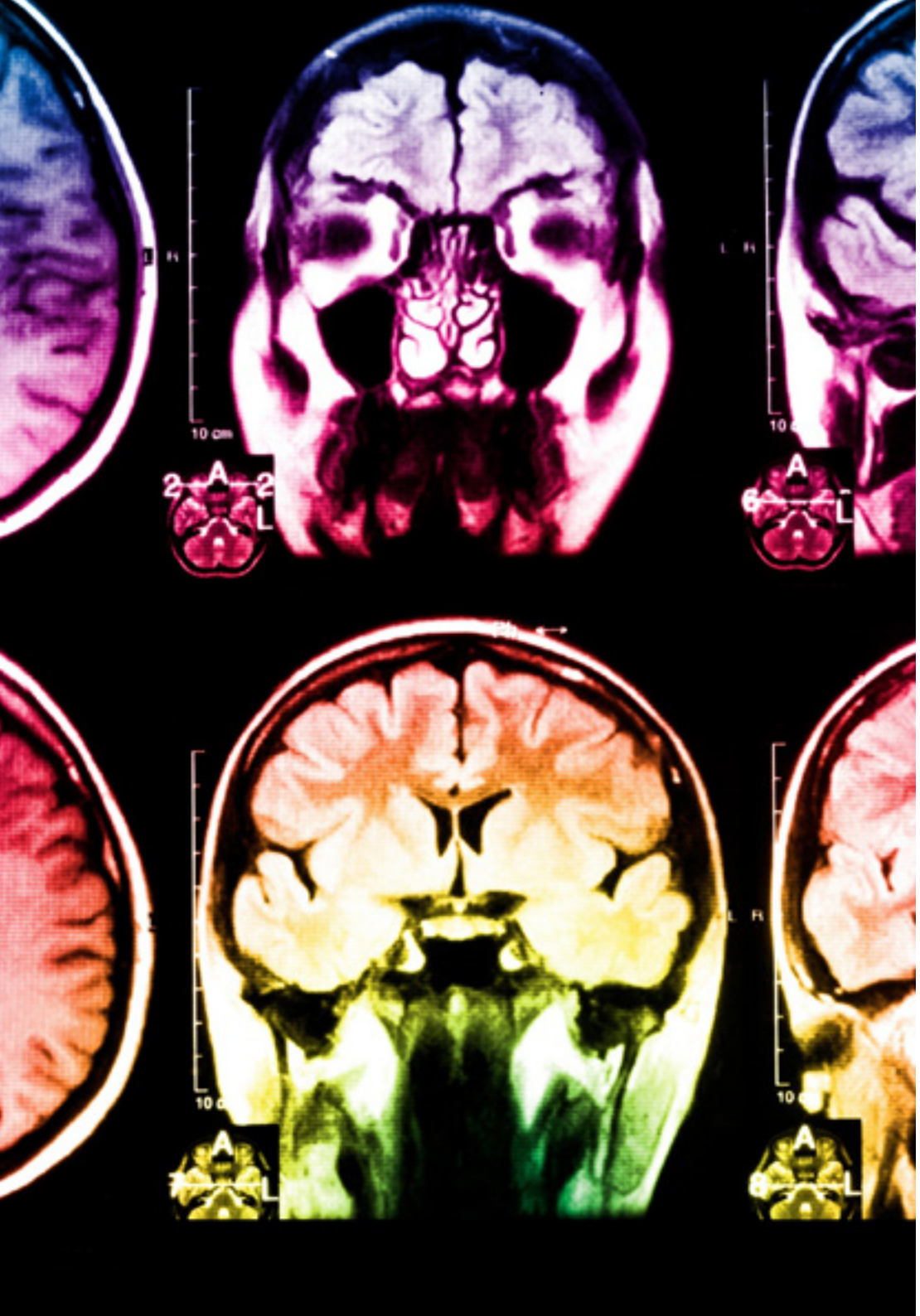
TECH effectively combines the Case Study methodology with a 100% online learning system based on repetition, which combines 8 different teaching elements in each lesson.

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.

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.

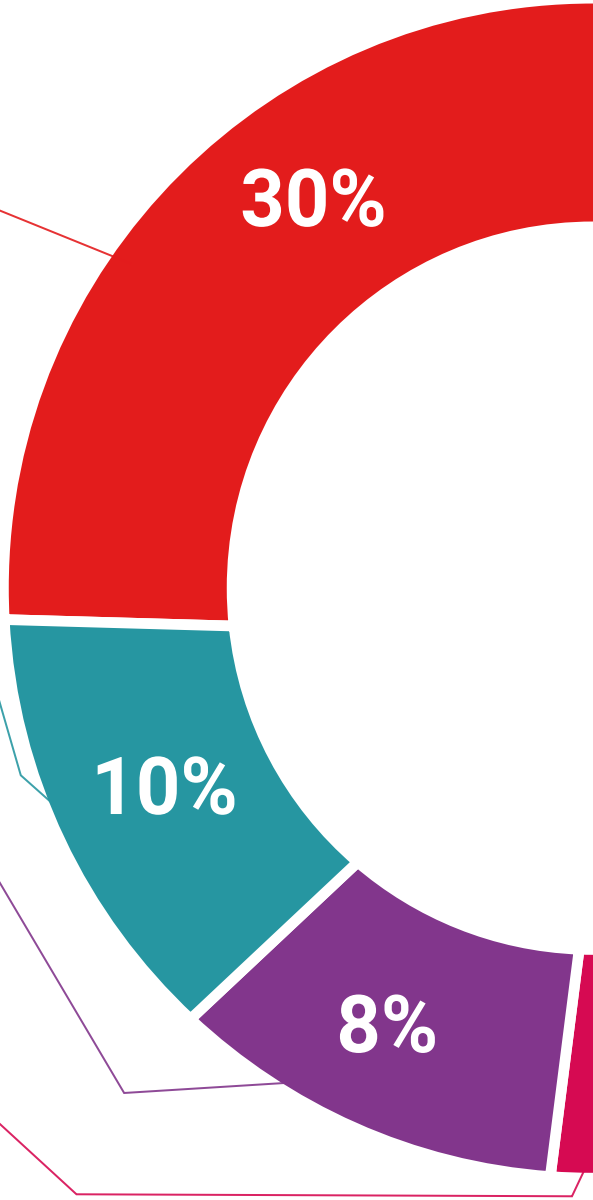
Learning from an Expert strengthens knowledge and memory, and generates confidence in future difficult decisions.

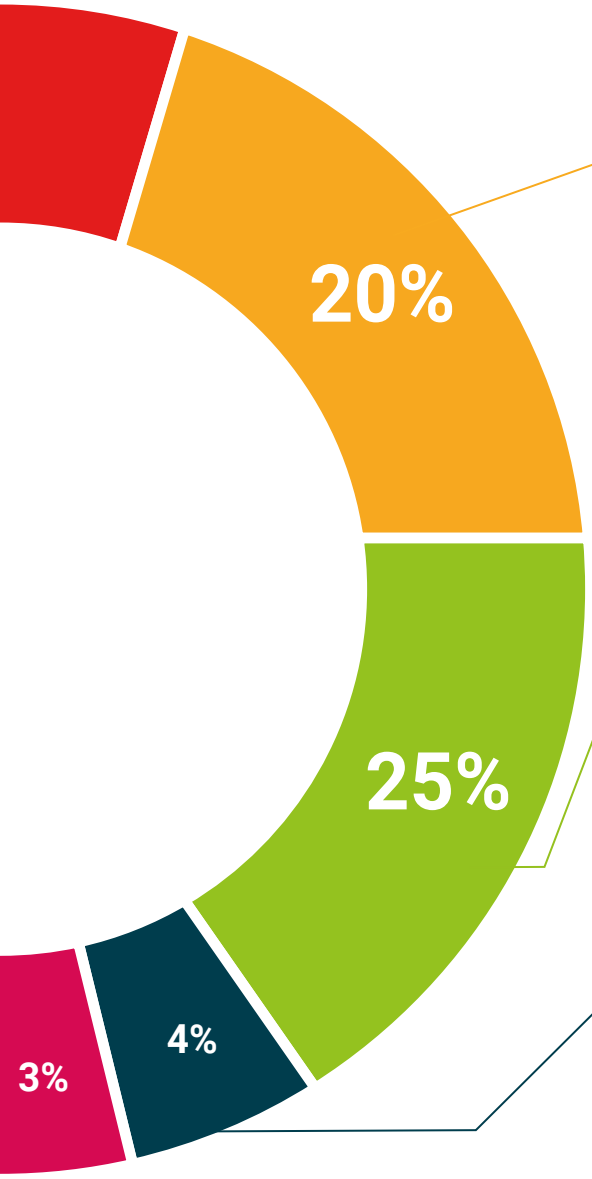
Practising Skills and Abilities

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

This Postgraduate Certificate in Acoustic Measurements and Advanced Instrumentation guarantees students, in addition to the most rigorous and up-to-date education, access to a Postgraduate Certificate issued by TECH Global University.

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

This program will allow you to obtain your **Postgraduate Certificate in Acoustic Measurements and Advanced Instrumentation** 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** title 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: **Postgraduate Certificate in Acoustic Measurements and Advanced Instrumentation**

Modality: **online**

Duration: **12 weeks**

Accreditation: **12 ECTS**


tech global university

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

Postgraduate Certificate in Acoustic Measurements and Advanced Instrumentation

This is a program of 360 hours of duration equivalent to 12 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
Rector

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 Global University will make the necessary arrangements to obtain it, at an additional cost.

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