



Description

The Vicoustic Academy Room Acoustics course is an intensive 2 days training program for professionals and students who want to understand the three main areas where a room acoustic project should act: acoustic treatment; sound insulation and noise control. In this short but intensive training program, trainees will not only learn the acoustic principles of sound behaviour in rooms but also experience how sound energy interacts with different materials inside rooms and its influence on the room's acoustics response at the Vicoustic R&D Centre.

The Vicoustic R&D Centre is a Unique and Innovative Centre that includes:

- **A Multifunctional Room** with magnetic walls that allows the students to easily mount and dismount any combination of acoustic products to them and feel its performance and influence in the room's acoustics instantaneously. This concept is already creating a ripple effect and is being adapted in demo rooms and testing facilities around the globe.

- **An Innovative Acoustic Chamber** with exclusive features that continues to be unique in the world. This is a Variable Volume chamber that allows performing acoustic tests in various room sizes, and in this way deeply study room modes. In addition, this chamber is convertible from a reverberation chamber into an anechoic chamber, allowing both free field and diffuse field conditions to be achieved.

At the end of the program, students will have a half-day presentation of Vicoustic products. Here people will have a deep overview and contact with different acoustic materials used for acoustic treatment, sound insulation and noise control projects. Different installation techniques, practical applications and their benefit in terms of acoustics performance will also be covered.

This course will then give the student a unique hands-on experience that will go through the room acoustics design process to listening the final acoustic result considering different types of acoustic treatment, and at the same time covering practical project aspects such as different installation techniques and their benefit in terms of acoustics performance.

Aims and Scope

The aim of this course is to train students to carry out the acoustics design of different room types, in accordance with state-of-the-art standards and guidelines. Although the full design and detailed specification of all aspects of architectural acoustics is beyond the scope of this course, it is expected that students will gain understanding of the principles and practice involved in the acoustic design of different types of spaces. The general goal is to illustrate and work with the fundamental aspects of the acoustics of different types of rooms from concert halls and theatres to control rooms, hi-fi rooms, offices and schools amongst others. Specific goals include:

- To introduce the students the three main areas where a room acoustic project should act (acoustic treatment, sound insulation and noise control).
- To introduce the students to the concepts and techniques employed in the calculation of room acoustical parameters in rooms.
- To give the student direct experience of the design process of the acoustics of a room for different purposes.
- To allow the student to interact with different acoustic products for particular applications.
- To give the student experience with the application of design concepts to a real room, enabling the use of different materials and solutions for specific purposes.
- To give the student experience in different acoustic products installation techniques and practical applications

Course content

First Day

9:00 - Welcome

9:30 - Introduction

1. Acoustic Fundamentals
 - 1.1. Sound Signals
 - 1.2. Human Audition
 - 1.3. Wave Interference
 - 1.4. Human Perception of Sound
 - 1.5. Measuring Sound
 - 1.6. Other Acoustic Quantities

11:00 - Coffee Break

11:30 - 2. Acoustics within enclosed spaces

- 2.1. Diffuse Field
- 2.2. Sound in Rooms
- 2.3. Sound Reflections, Diffraction, Scattering and Absorption
- 2.4. Acoustic Defects

13:00 - Lunch

14:00 - 2. Acoustics within enclosed spaces (Continuation)

- 2.5. Visit to the reverberant chamber



- 15:00** - 3. Room Acoustic Project
3.1. Acoustic Treatment
- 16:00** - Coffee Break
- 16:30** - 3. Room Acoustic Project
3.1. Acoustic Treatment (Continuation)
3.2. Sound Insulation
3.3. Noise Control
- 17:30** - End of First Day

Second Day

- 9:00** - Introduction
- 9:30** - 4. Reverberation Time Prediction
4.1. General Equation
4.2. Sabine
4.3. Norris-Eyring
4.4. Millington-Sette
4.5. Cremer
4.6. Fitzroy-Young
4.7. Arau-Puchades
- 10:30** - 5. Case Study (Acoustic Treatment)
- 11:00** - Coffee Break
- 11:30** - 5. Case Study (Acoustic Treatment)
- 13:00** - Lunch
- 14:00** - Visit to Vicoustic's Anechoic Chamber
- 15:00** - 5. Case Study (Acoustic Treatment)
- 16:00** - Coffee Break
- 16:30** - 6. Case Study (Noise Control)
- 17:15** - 6. Case Study (Sound Insulation)
- 18:00** - End of Second Day

Target audience

The course is intended for undergraduate or postgraduate students, researchers and professionals, ranging from architects, designers and engineers to musicians and sound technicians, who would like to get a further insight into the concepts and applications in room acoustics

Entry Requirements

Only 10 candidates are accepted in this training edition. A selection process will be carried out, based on the analysis of the candidate's CV, to be sent when applying for enrolment.

Learning outcomes

After this training program the trainee will be able to:

- Understand the three main areas where a room acoustic project should act (acoustic treatment, noise control and sound insulation);
- Determine the correct acoustic criteria for different room types (acoustic treatment, sound insulation and noise control criteria);
- Identify, describe and select the appropriate acoustical parameters for different applications;
- Find adequate solutions for the acoustic treatment, sound insulation and noise control of different room types;
- Understand and mitigate acoustic defects within small and big rooms;
- Develop simple calculation tools for room acoustic analysis purposes.

Course material and resources

Course material

All trainees will be provided with a physical documentation and course contents presented during the training.



Resources

During the program the following Vicoustic resources will be used:

- Vicoustic's Multifunctional Room
- Vicoustic's Reverberant Chamber
- Vicoustic's Anechoic Chamber
- Acoustic measurement tools
- Omnidirectional sound sources and microphones
- Different types of acoustic panels

Student resources needed

The students are expected to bring their own laptop incorporating a spreadsheet editor.

Language

The program is presented in English.

Lecturer's biography

Gustavo is specialised in providing acoustic design and assessment services, specifically tailored to meet client's aspirations and spaces or environment acoustic needs.

He joined Vicoustic in March 2017 coming from independent Multi-Disciplinary Engineering companies in London, UK, and is now acting as Vicoustic's Technical Director. Gustavo has more than 14 year's experience in Acoustics, having managed and delivered a diverse range of acoustic projects across many sectors and global regions, from architectural, building and room acoustics (including auditoriums and recording rooms) to environmental, urban, industrial and construction noise (including airports and wind farms).

This ability to cross-different acoustic sectors and worldwide projects experience is one of Gustavo's key strengths. In addition to his strong engineering practice knowledge, Gustavo can also present a strong scientific background. He has concluded his degree in Physics Engineering in the Acoustics Laboratory of the University of Eindhoven, where he has developed a research project in Room Acoustics. He has a MSc. in Physics Engineering, from the University of Lisbon, with a thesis related with sound insulation models. In addition he has an Advance Diploma Formation in Acoustics Engineering, also from the University of Lisbon.

Linking scientific knowledge with engineering practice is therefore another of Gustavo's key strengths. He is a Member of the Institute of Acoustics in UK since 2013, through which he has become a Chartered Engineer. He is also a Member of the Portuguese Engineering Council since 2007, having obtained the Specialist title in Acoustics Engineering in 2017.