

Vibration

Do you perform vibration tests on a electrodynamic shakers? Do you ever feel you are just trying to setup tests following ISO or MIL standards but want to know what the deeper meaning is and how you can define your tests more accurate and how to make them represent more the real time environment of your product? Then you came to the right place to learn all about vibration tests and how to optimize them.

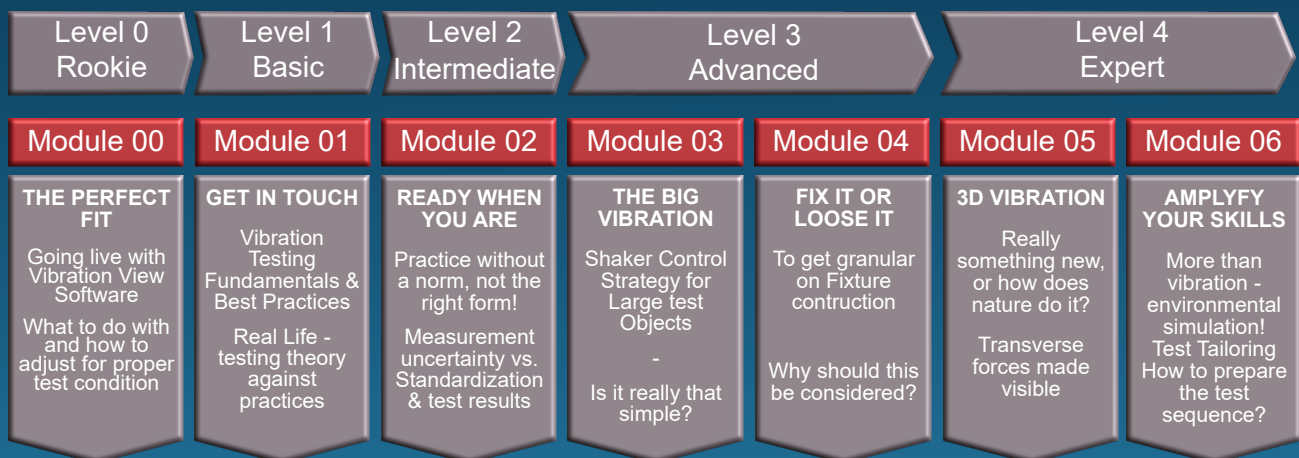
The Vibration Academy has been developed in partnership with the VRU (Vibration Research University)

Our comprehensive training program on vibration testing, developed in collaboration with Vibration Research. Whether you are performing vibration tests on an electrodynamic shaker or striving to align your testing processes with ISO or MIL standards, our program offers a deep understanding of the underlying principles.

Gain insights into defining tests more accurately to mirror real-time environmental conditions for your products.

Designed for individuals ranging from beginners to aspiring experts in vibration testing, our training program is divided into four blocks, progressing from foundational knowledge to expert proficiency. Elevate your capabilities as a vibration engineer and enhance your effectiveness in the field.

For vibration engineers operating in accredited laboratories, our program ensures that you receive the necessary training to demonstrate compliance with accreditation standards.



Key Highlights of Our Training Program:

- **Skill Evaluation:**** Each course begins with a thorough skill evaluation to determine your qualifications and guide you to the appropriate module. If you find that you do not yet meet the criteria, rest assured; you have the option to continue or start at a lower level, providing flexibility in tailoring your training to your specific needs.
- **ISO17025 Compliance:**** Our training modules are meticulously mapped to the requirements of ISO17025, offering a seamless alignment with industry standards. This ensures that you are well-prepared for audits.
- **Certificate Management:**** To simplify the certification tracking process, Vibration Research has integrated a feature into their app. This tool allows you to effortlessly monitor and manage your certificates for each completed module, streamlining the audit preparation process.



Choose our training program to gain a comprehensive understanding of vibration testing, from fundamental concepts to advanced methodologies, and elevate your proficiency as a vibration engineer.

Level 0 Module 00 Rookie

THE PERFECT FIT

Going live with Vibration View Software
What to do with and how to adjust for proper test condition

Goal: Acquire basic knowledge about operating and adjusting VR control software for your testing conditions.

Prerequisite: None

Content: During this workshop, you will acquire extensive knowledge about the correct settings for Sine, Random, and Shock, as well as other details that require your attention.

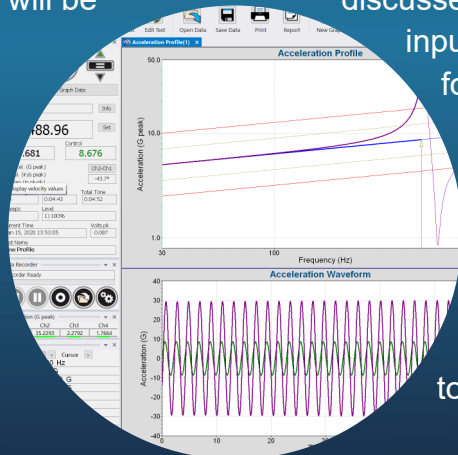
You will gain insight into testing with Sine, Random, and Shock profiles and understand their relationship with the shaker. You will learn what and how to test. Additionally, you will familiarize yourself with the operation of mechanical environment simulation and the meaning of the term “transfer function.” A connection will be made between FFT analysis and your testing conditions.

Furthermore, you will receive an overview of various control strategies, such as Single, Average, Min/Max, and Weighted, with practical examples. You will discover which control strategy is most suitable for your situation. You will also gain insight into your controller and understand why adjustments may be necessary.

The workshop also covers the creation of profiles in accordance with IEC 60068-2-6,27,64. You will learn why the sensor is the joystick for your controller and what the term “sensitivity” entails. Additionally, the necessary hardware and sensors for control will be

discussed, along with considerations for systems with digital inputs/outputs. Attention will be given to what is required for Plug & Play functionality.

By participating in this training, you will gain access to our tutorials and workshops. A wide range of topics with comprehensive support related to the shaker is offered here. Take advantage of these information resources to customize the shaker to your preferences or update your knowledge, enabling you to become the expert within your organization.



Level 1 Module 01 Basic

GET IN TOUCH

Vibration Testing Fundamentals & Best Practices
Real Life - testing theory against practices

Goal: How can I perform a simple mechanical environmental simulation with all components correctly without causing significant damage?

Prerequisite: You are familiar with the operating principle of the shakers.

Content: In Module I, you will discover the reason behind the “wobbling” of a shaker and receive an explanation of the “toolbox.” This toolbox contains essential knowledge needed for operating a shaker:

- Identification of necessary components for conducting a vibration test
- Understanding the consequences of misunderstanding the components and the resulting “wobble”
- Experience with the repercussions of attempting to outsmart physics
- Insight into the interdependencies of components and the consequences of neglecting these dependencies, especially when altering individual axes
- Development of skills to tackle challenges and understanding the mutual relationships in the application
- Exploration of the phenomenon of SINUS, where its simplicity is considered ingenious
- Understanding the concept of frequency response and its crucial role in shock absorber performance
- Examination of the delicate balance between shocks and being shocked, referred to as the SHOCK Strain
- Awareness of the importance of resolution and the underlying concept of “antialiasing”
- Analysis of the complexity of RANDOM and the question of whether everything truly happens at the same time
- Consideration of measurement uncertainty and its importance, despite trust in manufacturers
- Investigation into problem-solving and the principles that need to be applied, with the researcher as the main protagonist.

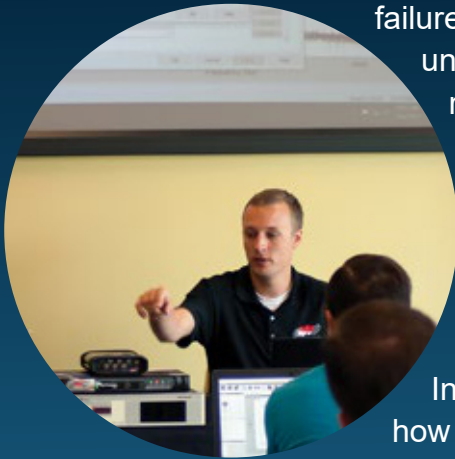


Level 2 Module 02 Intermediate

READY WHEN YOU ARE

Practice without a norm, not the right form!
Measurement uncertainty vs. Standardization & test result

Goal: How do I perform a mechanical environmental simulation while considering failure analysis, normative declaration, and measurement uncertainty, and how can I evaluate and compare the results with similar tests?

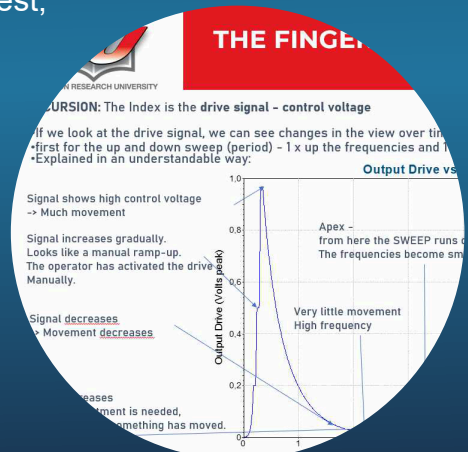


Prerequisite: You are familiar with the fundamentals of vibration analysis.

Content: Do you work daily with a shaker and provide a conformity statement according to specific standards?

In Module 2, a step-by-step explanation is provided on how to learn the objectives of a test.

- Explanation of the purpose of vibration tests and understanding modal analysis.
- Learning to observe and understand errors.
- Introduction to the visible vibration theory.
- Understanding the conformity statement (standardization).
- Treatment of the main objective and benefits of a test, including understanding the significance of similar measurement results.
- Learning about the importance of measurement uncertainty analysis (MU) with practical examples.
- Recognition of errors in the test system and interpretation of possible errors and their causes.
- Insight into the interaction between sensor/control system/machine/clamping/human.
- Gaining insight and understanding to achieve the 10% goal.



Level 3 Module 03 Advanced

THE BIG VIBRATION

Shaker Control Strategy for Large test Objects-
Is it really that simple?

Goal: How do I perform special cases of mechanical environmental simulation on large shakers correctly and reproducibly?

Prerequisite: Fundamentals of vibration analysis + measurement uncertainty + error analysis are known to you.

Content: Do you work with specimens that are so large that they cannot be fully attached to the traditional tables of a shaker?

In level 3, you discover the significance of the fact that the protruding parts of the inspected object must be “captured” by a well-designed fixture to eliminate undesirable effects.

- Learn how poorly designed fixtures can cause unwanted interference and how to deal with it.
- Understanding the use of so-called extensions/satellites to enlarge the clamping surface of the table.
- Insight into the concept behind it and its simplicity, but also its treachery.
- Acquire practical knowledge for mounting a test object over a very large surface.
- Learn to comply with normative requirements regarding fixtures.
- Gain tools to identify small causes that can have enormous effects.
- Learn various control strategies and subtleties related to sensors.
- Understand what rotational modes can do to a Device Under Test (DUT).
- Observation of the effect of a dynamic impulse on the overall system.
- Understanding dynamics and mechanical integrity.
- Observing the effect of thermodynamic effects and potential jamming issues, independent of the DUT.



Level 3 Module 04 Advanced

FIX IT OR LOOSE IT

To get granular on Fixture construction
Why should this be considered?

Goal: The “right attachment” for my DUT on the shaker without distorting my test.

Prerequisite: Fundamentals of vibration analysis + measurement uncertainty + error analysis are known to you.

Content: Do you attach your test pieces to the shaker and mount them on the shaker?
Do you design your own fixtures and need to ensure that they are correctly mounted?
Do you need to understand what the setup can do to your DUT?

In module 4, you will learn how to choose, determine, and develop the “right” attachment.

Understanding the special significance of a fixture and the damage that can occur when ignoring physical rules.



- Experience with the transfer function and the impact of the fixture on the Device Under Test (DUT).
 - Insight into the meaning of screw connections and why they are not a myth.
 - Ability to determine the right material choice and understanding the relationship with damping and thermal expansion.
 - Understanding the context in which the attachment influences the outcome of the test.
- Experience with slot holes and understanding their actual holding force.
- Experience with clamping force and understanding the deformation on the slip table and the resulting interaction between consequences.
- Knowledge of the calculation principles and construction skills needed to design fixtures correctly

Level 4 Module 05 Expert

3D VIBRATION

Really something new, or how does nature do it?

Transverse forces made visible

Goal: “Nature is not one-dimensional” – The big picture. The integration of movements and their effects!

Prerequisite: You already have fundamental knowledge of vibration testing and are familiar with some more specialized cases in the vibration testing world.

Content: Real systems generally have more than one degree of freedom and are rarely linear. We aim for a direct and clear understanding of lateral forces and how to deal with them.

In Module 5, you will learn how to “visualize” the operation of lateral forces and explain their connection to the test result.

You will acquire in-depth knowledge of mechanical dynamics and their impact on the test result.

- You will see the visual representation of “harmful” lateral accelerations.
- You will gain expert knowledge on how to analyze more realistic problems in Single Degree of Freedom (SDOF) systems.
- You will learn how to investigate free oscillations in undamped linear systems with more than one degree of freedom.
- You will be provided with an illustration of forced oscillation in lightly damped linear systems with many degrees of freedom.
- You will recognize the causal effect of damping and understand the countless possible capabilities.
- You will identify the cause and effect of lateral forces in SDOF systems and understand the diversity of results that contribute to it



Level 4 Module 06 Expert

AMPLIFY YOUR SKILLS

More than vibration -environmental simulation!
Test Tailoring How to prepare the test sequence?



Goal: Bringing the puzzle together – integrating all components and test elements to construct the “TEST CASE,” the one that is needed.

Requirements: You already have a fundamental knowledge of vibration testing and are familiar with some more specialized cases in the vibration test world, as well as with the general laboratory operation.

Content: Test finetuning is an approach to avoid errors, requiring a lot of know-how, but must be knowledge-based, and is the first choice when it comes to testing complex systems in a well-defined environment.

In Module 6, you will learn about environmental simulation and the influence of all components and test equipment with interaction, on and through the Device Under Test (DUT), in the context of the expected test result in mechanical vibration testing.

- You will learn the connection and experience the deepening of vibrations and the addition of factors of environmental simulation.
- You will learn which scenario needs to be taken to simulate the influences of the environment on technical products and reveal weak points.
- Q-Factor and what it means to understand this significance.
- You will learn to understand what FFT – Fast Fourier Transformation – means and why we need this to specify a test sequence.
- PSD – what does the Power Spectrum Density give us and what can we do with it?
- SRS – For which scenario is the Shock Response Spectrum suitable, and what statements can I make with it?
- FDS – What does the Fatigue Damage Spectrum mean? How do I deal with it? What can I test with this? Why do I need FDS at all?
- UDT – What possibilities does the User Defined Transient test sequence offer? Is this test sequence important for my products?