# ISO 18436 Category IV

Master Vibration Analyst Training & Certification

CAT-IV

## Online Learning & Public Classroom Course

The Master Vibration Analyst course is intended for personnel who have at least five years vibration analysis experience and Category III certification by a recognized certification body. The course provides an in-depth study of advanced signal processing, cross channel measurements, dynamics (mass/stiffness/damping, natural frequencies, modes), resonance testing (run-up/coast down tests, impact tests, ODS, modal analysis), corrective action (flow control, resonance correction, isolation and damping), proximity probe and casing measurements, orbit and centerline plot analysis, rotor dynamics (natural frequencies, modeling), journal bearings (design, fluid film instabilities), torsional vibration and flexible rotor balancing.

This course will take a practical approach to these subjects. Animations and software simulations will be used to make these topics easier to understand. Mathematics and theoretical derivations will be kept to an absolute minimum. Utilizing advanced 3D animations and software simulations, topics that were possibly beyond the reach of many vibration analysts will be far easier to understand. The aim is to provide the level of knowledge that enables the vibration analyst to understand these topics to a high degree, with the expectation that if advanced analysis, design modification or modeling is required, a specialist in those areas will be called-in.

## Detailed topic list:

### Principles of vibration

- Vectors, modulation
- Phase
- Natural frequency, resonance, critical speeds
- Force, response, damping, stiffness

### Data acquisition

- Test planning
- Test procedures

### Reporting and documentation

- Vibration diagnostics reports

### Signal processing

- RMS / peak detection
- Analog/digital conversion
- Analog sampling, digital sampling
- FFT computation
- Filters: low pass, high pass, band pass, tracking
- Anti-aliasing
- Bandwidth, resolution
- Noise reduction
- Averaging: linear, synchronous time, exponential
- Dynamic range
- Signal-to-noise ratio
- Spectral maps

### Fault analysis

- Spectrum analysis, harmonics, sidebands
- Time waveform analysis
- Phase analysis
- Transient analysis
- Enveloping
- Electric motor defects
- Flow induced vibration, aerodynamics and liquids
- General fault recognition

### Corrective action

- Flow control
- Isolation and damping
- Resonance control

### Equipment testing and diagnostics

- Impact testing
- Forced response testing
- Transient analysis
- Transfer functions
- Damping evaluation
- Cross channel phase, coherence
- Operating deflection shapes
- Modal analysis

### Reference standards

- ISO
- IEC
- Relevant national standards

### Fault severity determination

- Spectrum analysis
- Time waveform analysis, orbit analysis
- Severity charts, graphs and formula

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### Principles of vibration

- Natural frequency, resonance, critical speeds
- Force, response, damping, stiffness
- Instabilities, non-linear systems
- Torsional vibration
- Instrumentation
- Proximity probe operation, conventions, glitch removal
- Shaft and casing measurements

### Fault analysis

- Orbit analysis
- Shaft centerline analysis
- Transient analysis
- Unbalance, bent shaft, cracked shaft, eccentricity
- Rubs, instabilities
- Resonance and critical speeds
- Turbomachinery

### Corrective action

- Low and high speed shop balancing
- Field balancing (single plane, two plane, static/couple, flexible rotor)

### Rotor/bearing dynamics

- Rotor/bearing dynamics
- Rotor characteristics
- Rotor modeling (rotor, wheels, bearings, aerodynamic effects)
- Bearing characteristics (fluid film bearings, housing and supports, seals, couplings)

## Course Review & Certification Exam Preparation

A key component of the Mobius Institute ISO Category IV hybrid course is the public classroom course component. The aim of the five-day classroom session is to combine education, review and exam preparation. Attendees will learn, and attendees will be tested. The sessions will be very interactive with ample opportunity to ask questions. As we review the topics covered in the Online Learning portion of the course, we will also challenge you with exam standard practical questions.

On the final day of the review course, you will take the ISO 18436 Category IV certification examination. The exam takes five hours to complete.