



March 21, 2005

Applied Vibration Analysis - Expert Category IV

Follows Category IV Guidelines Established by ISO 18436-2, "Condition monitoring and diagnostics of machine – Requirements for training and certification of personnel – Part 2: Vibration condition monitoring and diagnostics"

Prerequisites:	Two years or more training in mechanical technology or mechanical engineering at an accredited college, university or technical school is strongly recommended. Candidates should be able to manipulate simple algebraic equations, use a basic scientific calculator, and be familiar with the operation of personal computers.
ISO Certification	Requires 174 hours of formal training or independent study, Category III Certification, 60 months experience, and examination
Course Length	40 Hours
Certification Exam	40 questions, 3 hours time limit, closed book but a summary sheet of formulae is provided, passing score is 75% correct
Maximum # Students:	15

Course Objectives

Students who successfully complete this course will be able to:

- apply vibration theory and techniques, including measurement and interpretation of multi-channel spectral results such as frequency response functions, phase and coherence**
- understand and perform signal analysis, including understanding of frequency and time domain processing, including orbits and their limitations**



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(Objectives continued)

- determine the natural frequencies, mode shapes and damping of systems, components and assemblies using the frequency response function
- recommend corrective actions and/or design modifications, including component change or repair, isolation, damping, application of dynamic absorber, change of stiffness and change of mass
- provide technical guidance to vibration trainees
- interpret and evaluate published ISO codes of practice, International Standards and specifications
- recognize vibration caused by gas pulsation in machines such as reciprocating machines and screw compressors, and to measure the necessary parameters and recommend means for correction
- recommend corrective actions for resilient mounting and other holding-down and foundation problems

Syllabus and Seminar Schedule

Day One

8:00AM – 9:50AM	Principles of Vibration <i>Equations of Motion, Fourier Series, Auto Spectrum, FFT and IFFT, Transmissibility</i>
<i>9:50AM – 10:10AM</i>	<i>Break</i>
10:10AM – 12:00PM	Practice Problems and Exercises
<i>12:00PM – 1:00PM</i>	<i>Lunch</i>
1:00PM – 2:50PM	Data Acquisition <i>Multi-channel data collection instrumentation and other considerations</i>



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2:50PM – 3:10PM

Break

3:10PM – 5:00PM

Practice Problems and Exercises

Day Two

8:00AM – 9:50AM

Multi-channel Signal Processing

Coherence, Frequency Response Functions, Cross Spectrum

9:50AM – 10:10AM

Break

10:10AM – 12:00PM

Practice Problems and Exercises

12:00PM – 1:00PM

Lunch

1:00PM – 2:50PM

Applications of Multi-channel Processing

Calculating natural frequencies, damping, and mode shapes from FRF information, applications of the cross-spectrum

2:50PM – 3:10PM

Break

3:10PM – 5:00PM

Practice Problems and Exercises

Day Three

8:00AM – 9:50AM

Corrective Actions

Isolation systems and damping treatments

9:50AM – 10:10AM

Break

10:10AM – 12:00PM

Practice Problems and Exercises

12:00PM – 1:00PM

Lunch

1:00PM – 2:50PM

Corrective Actions

Designing dynamic absorbers, foundation design



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2:50PM – 3:10PM

Break

3:10PM – 5:00PM

Practice Problems and Exercises

Day Four

8:00AM – 9:50AM

Equipment Knowledge
Reciprocating machinery

9:50AM – 10:10AM

Break

10:10AM – 12:00PM

Practice Problems and Exercises

12:00PM – 1:00PM

Lunch

1:00PM – 2:50PM

Equipment Knowledge
Engine analysis, screw compressors

2:50PM – 3:10PM

Break

3:10PM – 5:00PM

Practice Problems and Exercises

Day Five

8:00AM – 9:50AM

More Applications of the FRF
Force Prediction

9:50AM – 10:10AM

Break

10:10AM – 12:00PM

Reference Standards
ISO, IEC, other national standards

12:00PM – 1:00PM

Lunch

1:00PM – 1:50PM

Practice Problems and Exercises

1:50PM – 2:00PM

Break

2:00PM – 5:00PM

Certification Examination