
Product Noise Control

Course No. 198

APPLICATIONS This course provides an introduction to the physics, principles, language and fundamental techniques used to control noise. Emphasis will be placed on the practical applications of the physical principles behind noise control.

FOR WHOM INTENDED The course is intended for technicians who work in sound control testing and engineers who have recently been assigned responsibility for product noise control. Upon completion of the course, the participant will be able to choose the appropriate noise control mechanism (absorption, barriers, source modification) and avoid the costly over-application of noise control materials which is common in retrofit programs. The course will also be beneficial for engineering managers who must evaluate the noise control programs within their area of responsibility.

BRIEF COURSE DESCRIPTION A short introduction will be given to subjective measures of noise which serve as the background for many of the noise measurement methods in common use. The control of existing product noise through the design of enclosures and barriers will be covered. This course will also include a discussion of the design and qualifications of anechoic rooms, reverberant rooms and outdoor test sites.

While the course is developed for participants from the automotive industry—manufacturers, OEM companies and supplier companies responsible for automotive noise control treatments—the material will also be applicable to personnel from other industries. Examples and case studies from automobile applications and various heavy duty vehicle applications will be discussed if time permits.

The material presented will be practical in nature with mathematics limited as much as possible.

BENEFITS Participants will become familiar with noise control technology and gain an understanding of the basic physical principles needed to solve noise problems. Success in noise control, as in many other areas, rests with a good grasp of the fundamentals. The course provides practical solutions to difficult problems.

CERTIFICATE PROGRAMS This course is a recommended elective for TTI's [Mechanical Design Specialist \(MDS\)](#) certificate program. It may be used as an elective for any other [TTi specialist certificate program](#).

PREREQUISITES There are no formal prerequisites for this course. Supervisors are invited to contact the Institute on prospective attendees' backgrounds and needs.

TEXT Each student will receive a set of [course notes](#) including most of the viewgraphs used in the presentation.

COURSE HOURS, CERTIFICATE AND CEUs Open courses meet seven hours per day. Upcoming presentation dates can be found on our current [open course schedule](#). Class hours/days for on-site courses can vary from 14–35 hours over 2–5 days as requested by our clients. Upon successful course completion, each participant receives a certificate of completion and one Continuing Education Unit (CEU) for every ten class hours.

For [schedules](#), [general information](#) and [registration forms](#), see TTI's web site.

Course Outline

Introduction to Noise: The Nature of Sound
Acoustic Measurements and Terminology: Propagation Velocity
Pressure • Sound intensity • Impedance
Frequency and Wavelength • Use of Decibels
Sound Pressure Level (SPL), Sound Power Level (PWL)
Adding, subtracting, averaging SPL or PWL
Spreading of Sound Waves • Sound Level Variation
Directivity Index • Doppler Effect
Basic Noise Control Concepts
Absorption of Sound • Absorption vs. Thickness
Membrane Coverings • Perforated Metals
Absorption • Reverberation • Barriers • Enclosures
Absorption vs. Damping; Damping vs. Isolating
Basic Concepts in Noise and Vibration
Sound Perception • Terms • Loudness Perception
Fletcher Munson Curves • Noise Criteria (NC) Curves
Noise Rating (NR) Curves • Stevens Method
Vibration Basics: Sine Wave • RMS Values • SDOF Systems
Harmonic Waves • Radians • Natural Frequency (Resonance)
Transmissibility • Isolation • Damping
Critical Frequencies • Structural Propagation — Rods
Noise Measurement: Instrumentation • Microphones
Definitions of Terms: Free field • Free Field Response
Pressure Response • Diffuse Field (Random Incidence)
Free-Field and Random-Incidence Corrections
Reverberant Rooms • Capacitor Microphones
Electret Microphone • Dynamic Range • Frequency Range
Moving-Coil or Dynamic Microphone • Piezoelectric Microphones, Direct
Piezoelectric Effect • Ceramic Systems
Microphone Calibration: Reciprocity • Closed Chamber
Microphone Windscreens • Sound Level Meters (SLM)
Weighting Curves • Detectors
Vibration Instrumentation • Use of Accelerometers:
Basic Principles, Bridge Type, Piezoelectric Type • Calibration
Mounting • Selection and Care, Limitations
Spectrum Analysis: Spectrum Analyzer • Parallel Filter Analyzer
Filters • Time-Compression Analyzers • FFT Analyzers
Fourier Transforms • Resolution • Windows • Ripple • Aliasing
Bandwidth • Cross Spectrum • Transfer Functions • Coherence
Data Capture and Analysis: Magnetic Tape Recording
FM Principle • Frequency Division Multiplexing
Digital Audio Tape (DAT) Recorders • Signal Sources
Sampling Frequency • Filtering and Oversampling
Analog-Digital Conversion
Design of Facilities: Reverberant Rooms
Anechoic and Hemi-anechoic Rooms • Outdoor Sites
Dynamometers: Eddy Current, Hydrokinetic • Existing Standards
Testing Acoustical Materials: Acoustic Materials Standards
Absorption: ASTM C 423, ASTM C 384, ASTM B 1050
Barriers: ASTM E 90, SAE J 1400,
Damping: ASTM E 756, SAE J 1637
Quiet Design for Automotive Applications: Noise Control Materials
Typical Absorbers and Barriers in Vehicles
Sources of Noise in Vehicles: Tires • Road • Wind • Accessories
Seals and Leaks • Interior Vehicle Modes
Summary • Final Exam
Award of Certificates for successful completion



Technology Training, Inc.

(a tti group company)

Toll-free telephone:

866-884-4338 (866-TTi-4edu)

805/715-2638 Fax: 805/715-2650

E-mail: Training@ttiedu.com

<http://www.ttiedu.com>