



CJS Labs

Electroacoustic Measurements

This course focuses on the fundamentals of electroacoustic measurements, including principles of acoustics, instrumentation, and data interpretation as well as practical information on how to perform appropriate tests. This course is intended for technical persons who are responsible for the acoustical performance of audio and electroacoustic products and audio, either in R&D or in Production. The course is appropriate for both novices and persons with some test and measurement experience. This training enables participants to perform accurate audio and electroacoustic tests and provides them with the necessary tools to understand and correctly interpret the results.

Instructor

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CEO & Chief Scientist – CJS Labs

Course Outline

Introduction

- Transducers & Reciprocity
- Subjective & Objective Tests
- Loudspeaker and Microphone Test Systems

Basic Acoustics and Measuring Sound

- Sound Pressure & Sound Pressure Level
- Wavelength & Frequency
- The Decibel and Working with Decibels
- Weighting Networks
- Detectors, and Time Constants

Sound Sources and Sound Fields

- Ideal Sources, Sound Radiation, and Sound Fields
- Transmission, Reflection and Diffraction
- Elementary Room Acoustics
- Anechoic Chambers and Reverb Rooms

Psychoacoustics & Hearing

- Frequency and Dynamic Range
- Masking & Critical Bands
- Directional Effects
- Anatomy of the Ear
- Detection and Signal Processing within the Ear
- Loudness & Hearing Loss

Measurement Microphones

- Principles of Operation
- Frequency & Dynamic Range
- Microphone Types, Selection and Applications
- Field Calibration

Frequency Analysis

- Signal Types
- Filters and Filter Analysis
- Confidence Limits, and Averaging Time
- The FFT
- Time Windows, Overlap & "Real Time" Analysis

System Analysis

- Time & Frequency Domains
- Causal Linear Time-Invariant Systems
- Analysis Methods: Dual Channel FFT, MLS, TDS
- Stimulus Signals

Simulated Free Field Measurements

- Sound Paths, Correlated and Uncorrelated Noise
- Quasi-Anechoic Test Methods
- Near Field Measurements
- Time Selective Techniques

Distortion & Non-Linearity

- Non-Linear Systems & Distortion Order
- Distortion Audibility
- Transducer Defect Detection
- Harmonic, Intermodulation & Difference Frequency
- Distortion Tests
- Measurements of Band-Limited Systems
- Multi-Tone Distortion
- THD + N
- Signal-to-Noise Ratio and Non-Coherent Power
- Time Variance and Linearity Measures

Special Topics

- Impedance and Small Signal Parameters
- Vibration Measurement and Modal Analysis
- Free Field Microphone Testing
- Sound Field Equalization
- Directional Measurements and Polar Response
- Directivity Index
- Simulated Diffuse Field Testing
- Equivalent Input Noise
- Time-Frequency Analysis