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

Christopher J. Struck
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