Course Title:

Signal Processing with MATLAB

Course Purpose:

This two-day course shows how to analyze signals and design signal processing systems using MATLAB, Signal Processing Toolbox™, and DSP System Toolbox.

Topics include:

- Creating and analyzing signals
- Performing spectral analysis
- Designing and analyzing filters
- Designing multirate filters
- Designing adaptive filters

Pre- requisites:

MATLAB® Fundamentals or equivalent experience using MATLAB, and a good understanding of signal processing theory, including linear systems, spectral analysis and filter design.

- ✓ 2 training days
- ✓ Hours: 09:00-17:00
- ✓ Total training hours: 16

Teaching method:

The course combines lectures, demonstrations and practical exercises in MATLAB, using original training books from MathWorks. The course is in Hebrew but the training materials are in English.

Training Center Systematics - Contact information:

Phone number: 03-7660111 Ext: 6 **Email:** training@systematics.co.il

Website: http://www.systematics.co.il/mathworks

www.systematics.co.il | מוקד שירות: 03-7660101 דוא"ל: info@systematics.co.il | טלפון: 03-7660111 פקס: 03-7660120 | סיסטמטיקס בע"מ רחוב ראול ולנברג 4, תל אביב 69719

Course Objective:

Signals in MATLAB

Objective: Generate sampled and synthesized signals from the command line and visualize them. Create noise signals for a given specification. Perform signal processing operations like resampling, modulation, and correlation.

- Creating discrete signals
- Sampling and resampling
- Visualizing signals
- Modeling noise
- Performing resampling, modulation, and correlation
- Generating streaming signals

Spectral Analysis

Objective: Understand different spectral analysis techniques and the use of windowing and zero padding. Become familiar with the spectral analysis tools in MATLAB and explore nonparametric (direct) and parametric (model-based) techniques of spectral analysis.

Discrete Fourier transform

- Windowing and zero padding
- Power spectral density estimation
- Time-varying spectra
- Using a spectrum analyzer in MATLAB

Linear Time Invariant Systems

Objective: Represent linear time-invariant (LTI) systems in MATLAB and compute and visualize different characterizations of LTI systems.

LTI system representations

- z-transform
- Frequency and impulse response
- Visualizing filter properties
- Applying filters to finite and streaming signals

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Filter Design

Objective: Design filters interactively using the Filter Design and Analysis app. Design filters from the command line using filter specification objects.

Filter specifications

- Interactive filter design
- Common filter design functions
- Filter design with filter specification objects
- Reducing filter delay
- Frequency-domain filtering

The Signal Analysis App

Objective: Learn to use a powerful all-in-one app for importing and visualizing multiple signals, performing spectral analysis on them, and designing and applying filters to the signals. Make simple statistical and cursor measurements on signals.

- Browse signals and make simple measurements
- Perform interactive spectral analysis
- Design and apply filters to signals interactively

Multirate Filters

Objective: Understand principles of polyphase multirate filter design. Design multirate interpolating and decimating filters. Design multistage and narrow-band filters.

- Downsampling and upsampling
- Noble identities and polyphase FIR structures
- Polyphase decimators and interpolators
- Design multistage and interpolated FIR filters

Adaptive Filter Design

Objective: Design adaptive filters for system identification and noise cancellation.

- Basics of adaptive filtering
- Perform system identification
- Perform noise cancellation
- Improve adaptive filter efficiency

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