

Digital Signal Processing with MATLAB® (25 hours)

This course mainly deals with using MATLAB® Signal Processing toolbox for Digital signal processing, analysis, visualization, and algorithm development. The training covers various topics such as windowing techniques, filter design, transforms, multi-rate signal processing etc.

COURSE CONTENT :

Introduction to DSP (3 hours)

- Introduction to DSP
- Sampled data systems
- Aliasing and antialiasing
- Reconstruction
- Practical limitations
- Frequency & amplitude resolution
- Quantization and timing errors
- Correlation and convolution
- Frequency analysis
- Fourier transforms
- Frequency 'leakage'
- Windowing
- Multi-rate signal processing

Transforms (2 hours)

- Fourier Transform
- Z – Transform
- DCT Transform
- Wavelet Transform

Filters (5 hours)

- FIR Filter –
- FIR filter basics
 - Analysis of FIR filters
 - Frequency & impulse responses
 - The window design method
 - Optimization design methods
 - Practical limitations of FIR filters
- IIR Filter -
- IIR filter basics
 - Analysis of FIR filters
 - Frequency & impulse responses
 - IIR filter design
 - Poles, zeroes and filter response

**DSP with MATLAB®
(5 hours)**

- Introduction to DSP Toolbox
- Signal processing functions in MATLAB® (conv, conv2, corrcoef, cov, cplxpair, deconv, fft, fft2, fftshift, filter2, freqspace, ifft, ifft2,unwrap)
- Time domain analysis of a signal
- Frequency domain analysis of a signal

**Digital Filter Design in
MATLAB®
(2 hours)**

- Discrete-Time Filters (Direct form I, Direct form II, lattice filters)
- 1_D Median filtering
- Butterworth filter design
- Chebyshev Type I filter design (pass band ripple)
- Chebyshev Type II filter design (stop band ripple)
- Raised cosine FIR filter design
- Recursive digital filter design

**Analog Filter Design in
MATLAB®
(2 hours)**

- Analog Lowpass Filter Prototypes
- Analog Filter Transformation
- Bi-linear transformation
- Impulse-invariant Methods
- Stabilising a polynomial
- Z-Transform partial fraction expansion

**Window Design
(2 hour)**

- Rectangular window
- Hamming window
- Hanning window
- Bartlett window
- Kaiser window etc

**Transforms
(2 hour)**

- Discrete fourier transform
- Discrete cosine transform
- Hilbert transform
- Discrete wavelet transform
- inverse transforms

**Multi-rate Signal Processing
(2 hours)**

- Decimation
 - Interpolation
 - Up-Sampling
 - Down-Sampling
 - Re-Sampling
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