SCHMALKALDEN UNIVERSITY OF APPLIED SCIENCES

Course Description – Summer 2025

Title	Digital Signal Processing for Engineering Applications
Faculty	Electrical Engineering
Professor	Prof. Dr. Carsten Roppel
ECTS	5
Level	Master
Requirements	Bachelor Degree Basic knowledge in signals and systems and Python is recommended.
Add. Information	Lecture and laboratory experiments
Content	1 Introduction Fourier Transform Refresher Filter Refresher Decibels Refresher 2 Sampling Theorem Quantization 3 Discrete-Time Signals and Systems Impulse Response and Convolution Fourier-Transform of Discrete-Time Signals Discrete Fourier-Transform (DFT) 4 Random Signals Energy Signals and Power Signals Probability Density Function (PDF) and Cumulative Distribution Function (CDF) Parameters and Moments of Random Signals 5 Bearing Vibration Analysis Overview Vibration Sensors Bearing Geometry and Characteristic Frequencies Sample Signals and Spectra Machine Learning

6 Digital Filters
General Structure of Digital Filters
Finite Impulse Response (FIR) Filters
Improving ADC Resolution by Oversampling and Filtering

7 Representation of Numbers and Quantization of Filter Coefficients