ADSPR Analog and Digital Signal Processing

Introduction to signal processing , Fourier series, Fourier transform, Z transform, sampling process, discrete Fourier transform, FFT, linear time-invariant systems, digital filters with FIR and IIR, effects of finite word lengths, random signals and their spectral analysis, examples of digital signal processing systems (audio, image, radar).

1) An Introduction to digital signal processing (DSP). Content of the course. Signals and their types.
2) Analog to Digital Converter (ADC) and Digital to Analog Converter (DAC) as a part of digital signal processing. Main characteristics of the converters. Number systems for DSP, principal operations in binary number systems.
3) Fourier series. Decomposition of a signal to Fourier series. Spectrum of a signal. Time sampling and amplitude quantization of a signal.
4) Sampling period and number of bits requirements needed for undistorted information transmission.
5) Amplitude quantization errors for rounding and truncation, statistical parameters of the quantization errors.
6) Direct and back Fourier transform, Z-transform.
7) Principal characteristics of a signal, mean values, power, energy, autocorrelation, crosscorrelation, ?
8) Linear time invariant systems (LTIS) as a principal DSP systems.
9) Output signal from LTI system as a convolution of an input signal and an impulse response of the system. Impulse response, step response, convolution and their transform.
10) DFT and FFT.
11) Digital filters, digital filters with finite impulse response (FIR).
12) Digital filters with infinite impulse response (IIR).
13) Digital processing of random signals, spectral analysis of random signals.
14) Examples of DSP (audio, image, radar).

Antoniou A.	Digital signal processing
Hayes M.H	Digital signal processing
Zelniker, G., Taylor, F.J	Advanced digital signal processing
Smith S.W	Digital signal processing

Ing.Jiří Konečný, Ph.D.