Title: Signal Processing

Lecturer: Prof. France Mihelič

Aim of the course: Providing students with the knowledge of different signal types and descriptions and processing methods.

Required (pre)knowledge: The basics of mathematical analysis, algebra and probability theory.

Contents:

- Introduction: basic definitions, short history of the signal processing theory, position of the signal processing theory in electrotechnical and other sciences.
- Signals classification: signals with finite energy and finite average power, periodical a-periodical, deterministic and random signals.
- Signals representations: the use of the signals representations, types of representations and representations, quality measures, examples of basic function sequences.
- Frequency analysis: Fourier series and Fourier transform.
- Random signals: approaches to the random signal processing, stationary random process, correlation and covariance functions, sampling and time averages, ergodicity.
- Signals correlation and convolution: correlation and convolution definitions and properties for different types of signals, similarity measures, random signal spectrum evaluations, convolution and linear stationary systems, detection of periodic components in combinations of signals.
- Sampling and quantization: purpose of the sampling and quantization, sampling theorem, representation of sampling and reconstruction, types of quantization, quantization error signal and its properties, quantization examples.
- Digital signal processing: discrete Fourier transform.

Selected references:

Haykin , S. S., Van Veen , B.: Signals and Systems, Wiley, 2003.
Phillips, C. L., Parr, J. M., Riskin, E. A.: Signals, Systems and Transforms, Prantice Hall, 2003.
Gray, R. M., Davisson, L. D.: An Introduction to Statistical Signal Processing, Cambridge University Press, 2004.
Ifeachor, E. C., Jervis, B. W.: Discrete transforms, Digital Signal Processing - A practical Approach, Prentice Hall, 2002.