

A decorative graphic on the left side of the slide, consisting of a blue square, a red square, and a yellow square, with a black crosshair-like structure overlaid.

Chapter 1

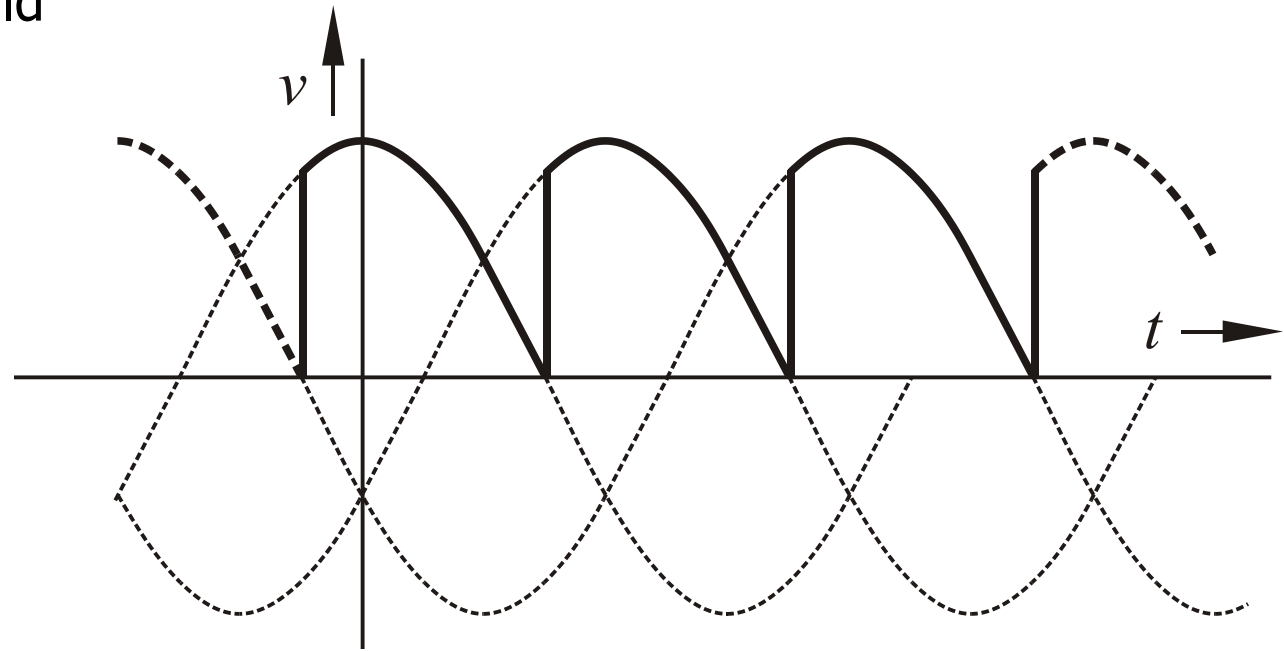
Introduction

- Examples
- Signal Notation
- Classification of Signals
- Signal processing
- Goals of this course
- Literature
- Organization

Examples

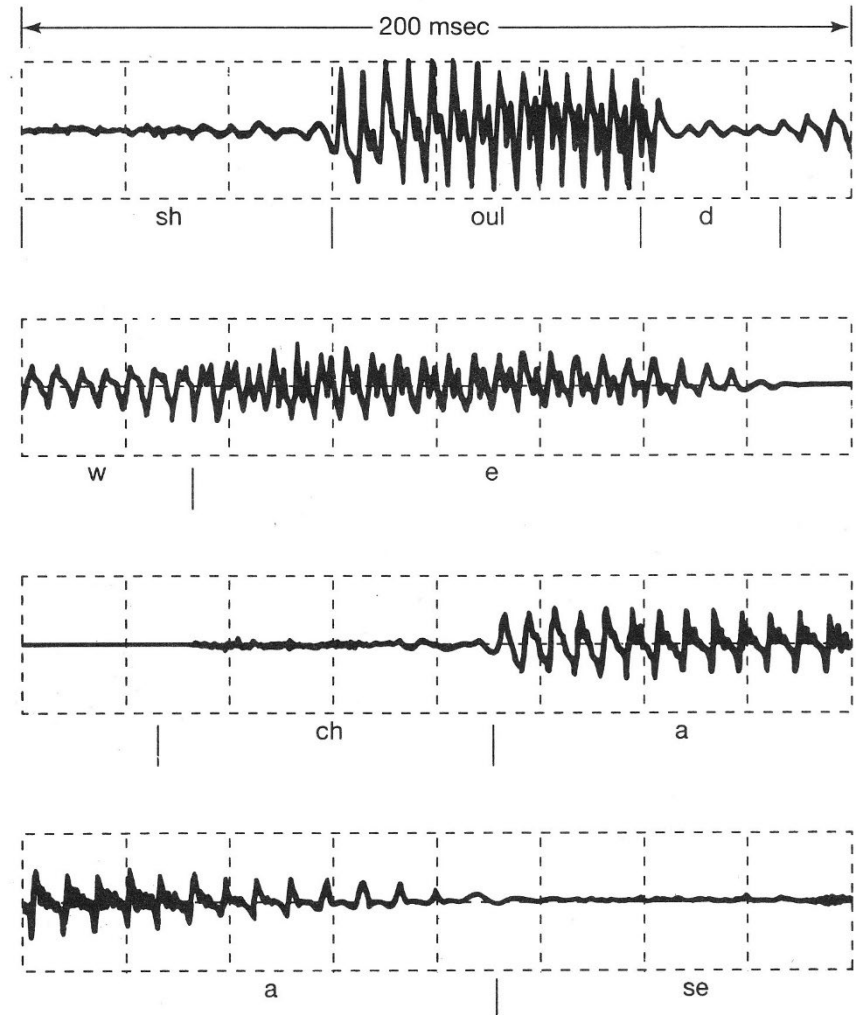
Energy application

- Electronic power converter
- Phase control
- Borchering's world



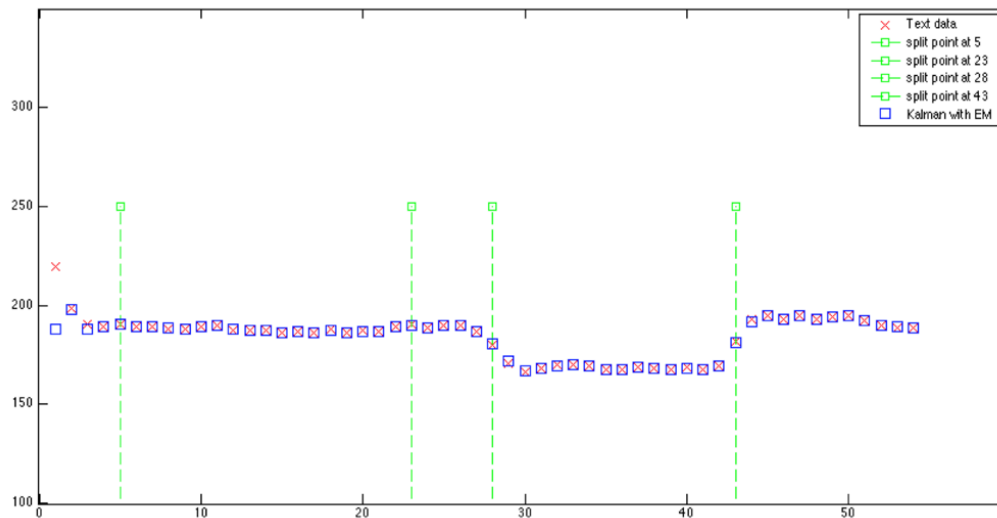
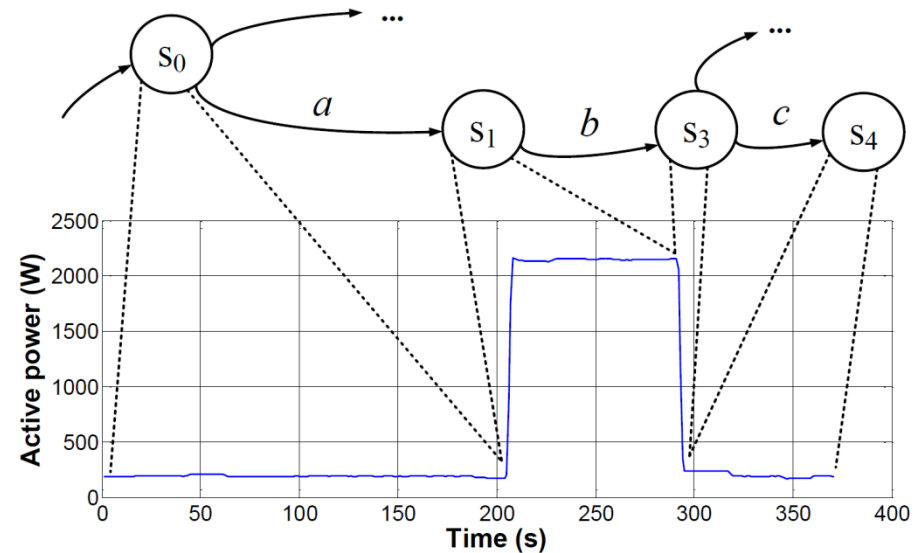
Speech signal

- Acoustic pressure variation for the spoken words "should we chase"
- Taken from [OPW]



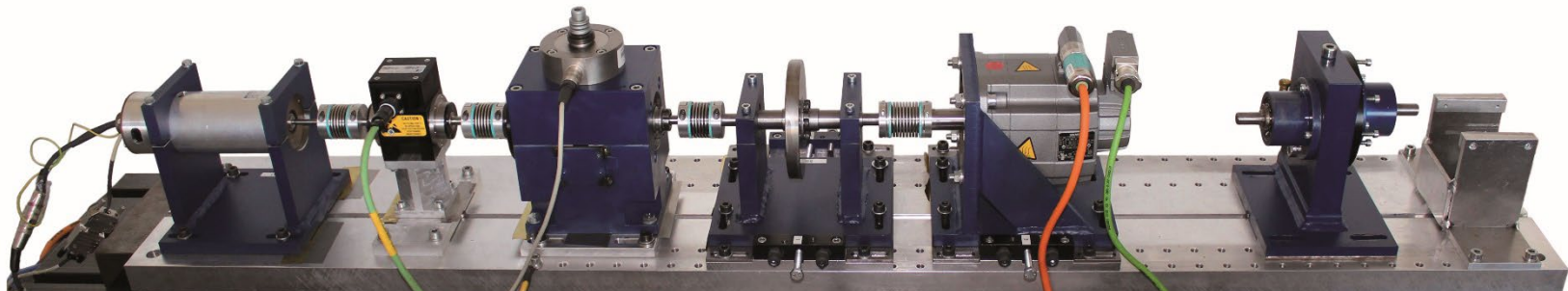
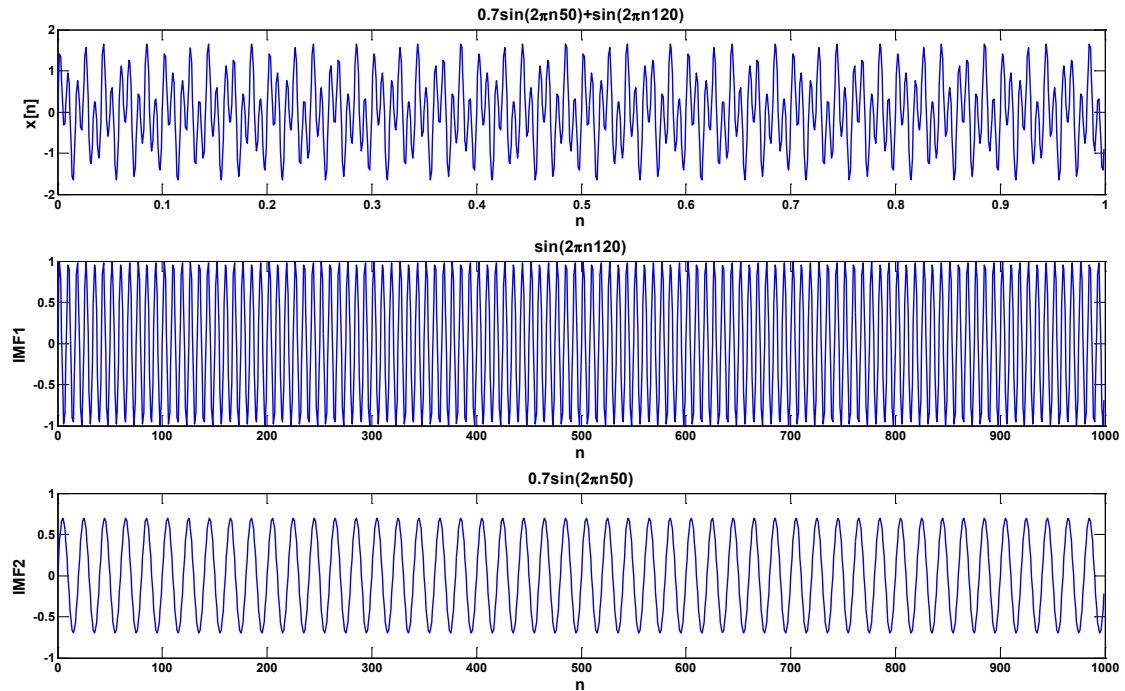
Condition monitoring

- Modeling the operation of hybrid automates
- Power and energy modeling
- Niggemann's world



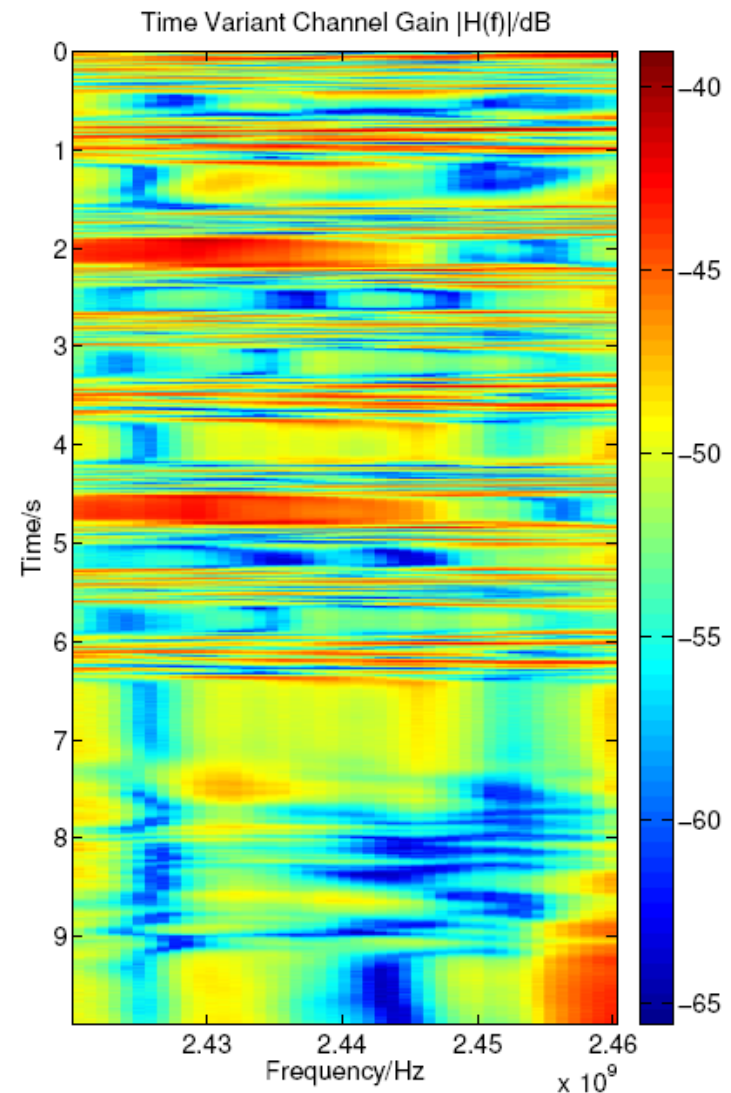
Condition monitoring

- e.g. "health status" of electrical drives
- check for intrinsic mode functions
- Lohweg's world



Radio channel

- Mobile robot application
- Time and frequency variant radio channel
- Meier's world

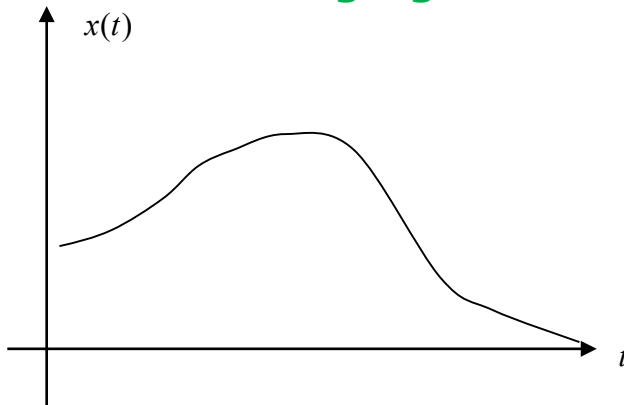


Signal Notation

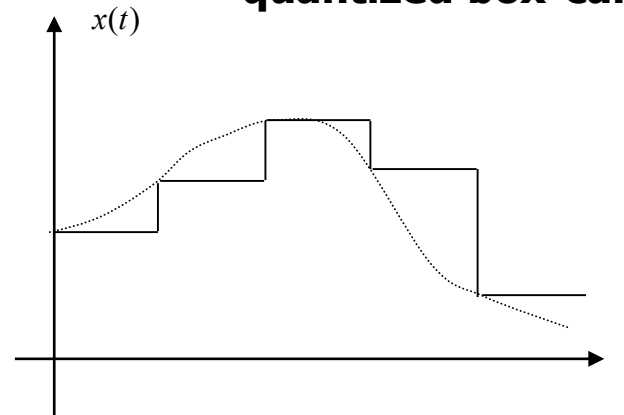
- Signals in this course are mainly considered as **mathematical measures**, i.e. their unit equals one.
- x, y, X, Y, \dots with **real** or **complex** values
- **Complex-conjugate** notation: $x = a + jb$, $x^* = a - jb$

Classification of Signals

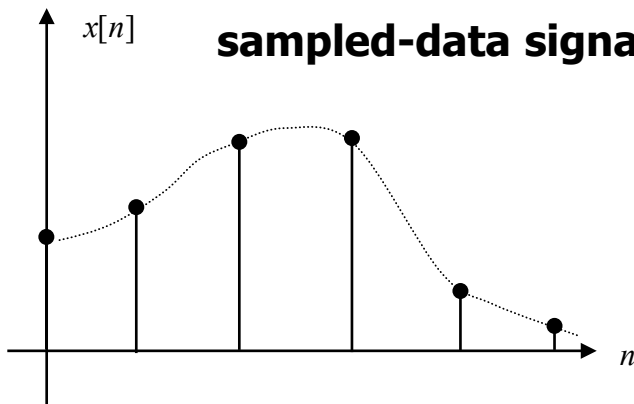
analog signal



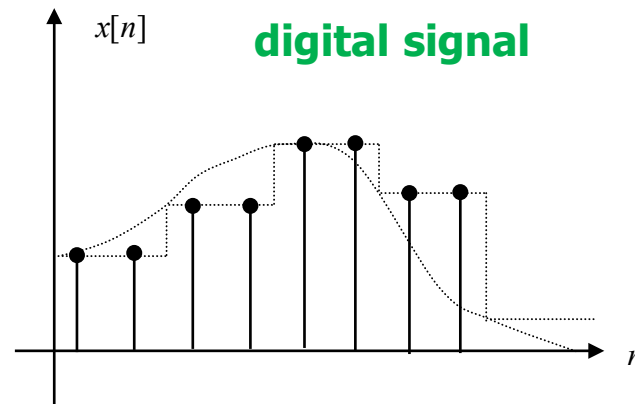
quantized box-car signal



sampled-data signal



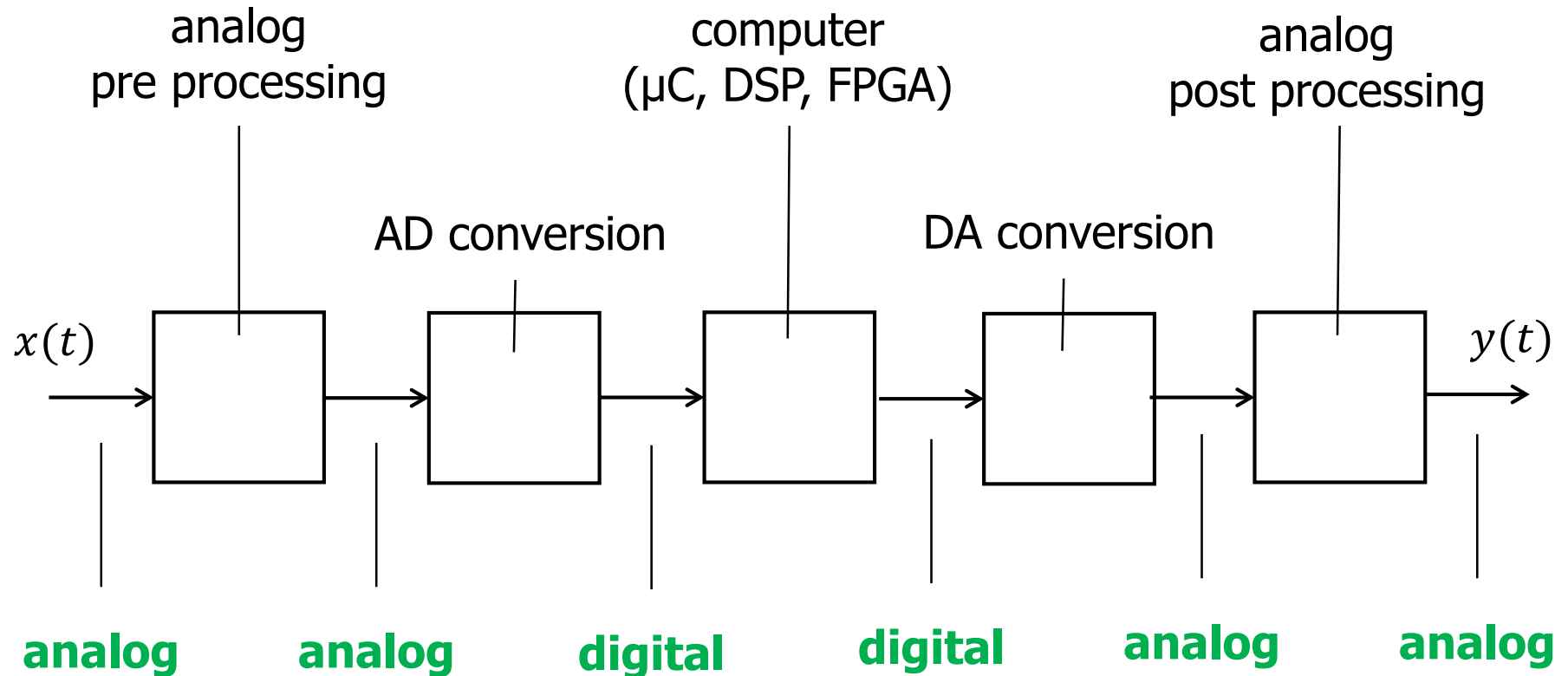
digital signal



Classification of Signals

- **Analog signals**: time and value continuous
 - **Quantized boxcar signals**: time continuous and quantized value
 - **Sampled-data signals**: time discrete and value continuous
 - **Digital signals**: time discrete and quantized value
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- Only digital signals can be processed by (digital) computers. → **computer-based approach**

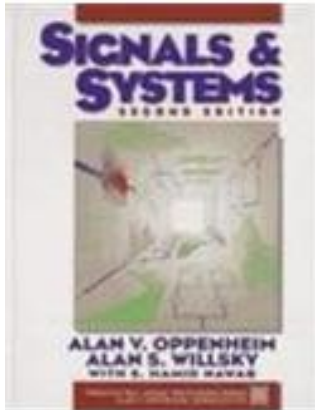
Signal processing



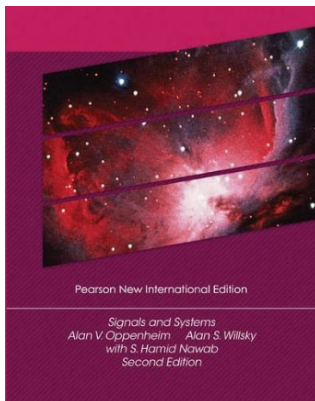
Goals of this course

- Course provides basic knowledge of how discrete signals and discrete linear time-invariant systems are characterized and analyzed
- Upon completion of the course students should be able to
 - describe sampling and reconstruction of signals
 - use appropriate transform methods
 - understand filtering with window functions
 - design frequency-selective filters
 - understand linear feedback systems
 - use simulation software for signal processing

Literature

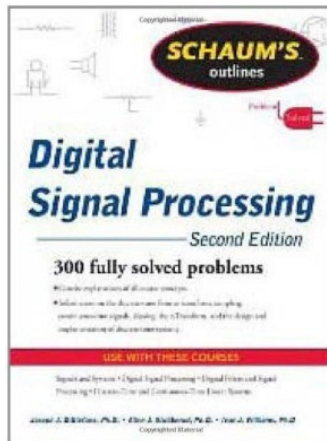


[OPW] Oppenheim, A. V, Willsky, A. S.:
Signals and Systems. Prentice Hall, 1997

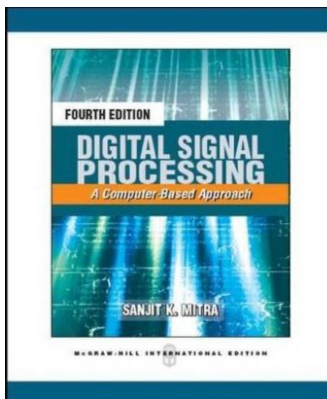


[OPW] Oppenheim, A. V, Willsky, A. S.:
Signals and Systems. Pearson Education
Limited, 2013

Literature



[HAY] Hayes, M. H.: Schaum's Outlines. Digital Signal Processing. McGraw-Hill, 2012



[MIT] Mitra, S. K.: Digital Signal Processing – A Computer-Based Approach. McGraw Hill, 2011

Organization

- 2.5...3 Lecture hours, 1.5...1 exercise → 5 Credits
- Homepage
 - Meier: <https://www.th-owl.de/eecs/fachbereich/fachgebiete/hochfrequenztechnik/>
 - Course DSS in ILIAS: https://ecampus.th-owl.de/goto_skim_ecampus_crs_206247.html
- Written examination
 - February or April
 - July or September