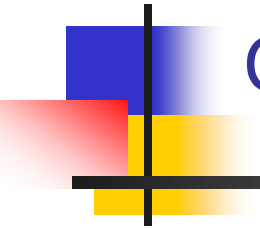


Chapter 1

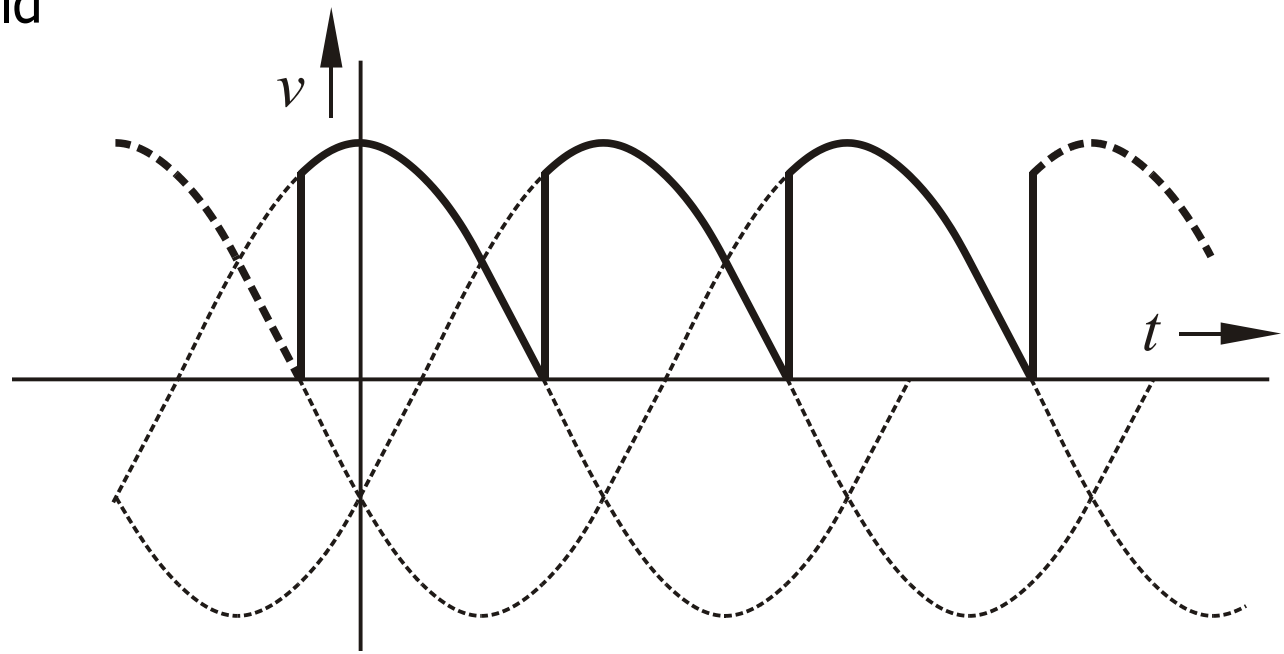
Introduction

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

Examples

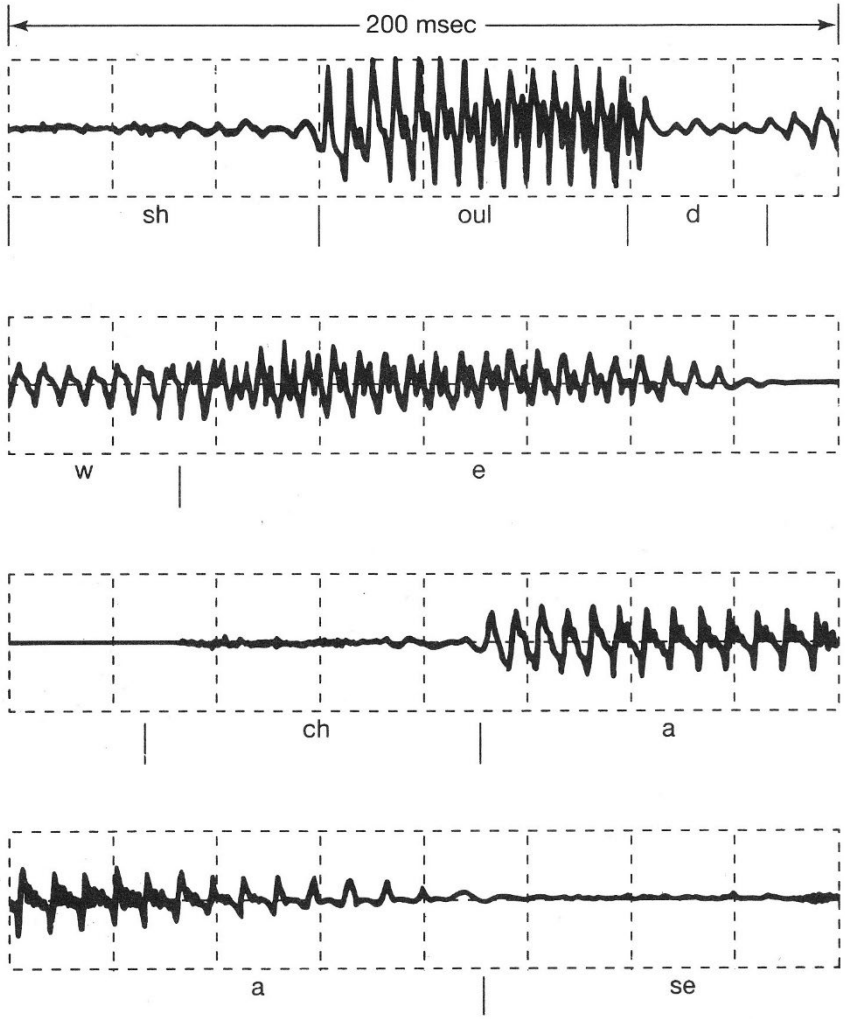
Energy application

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



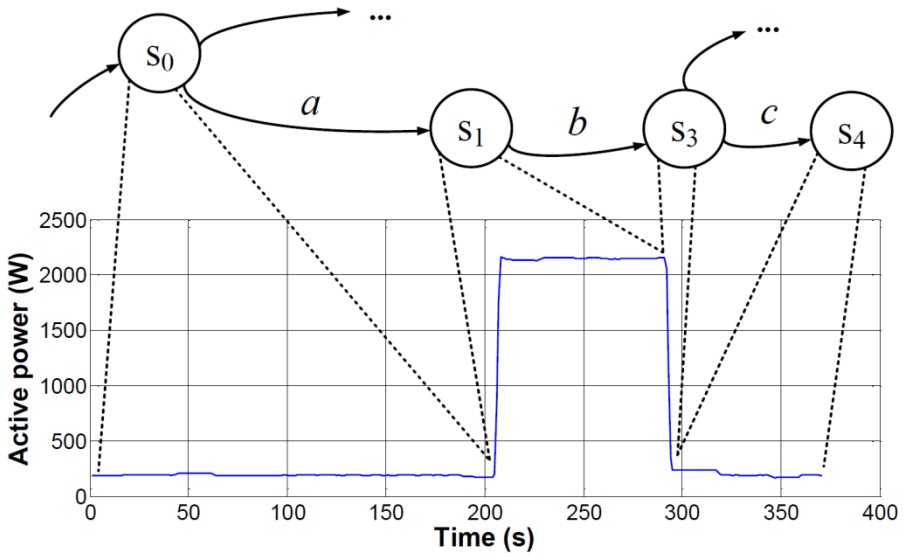
Speech signal

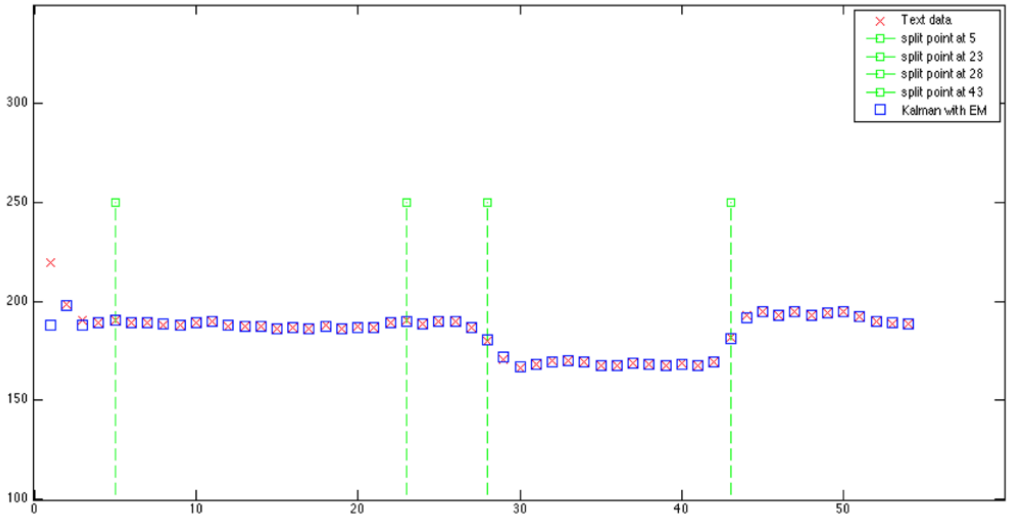
- Acoustic pressure variation for the spoken words "should we chase"
- Taken from [OPW]



Condition monitoring

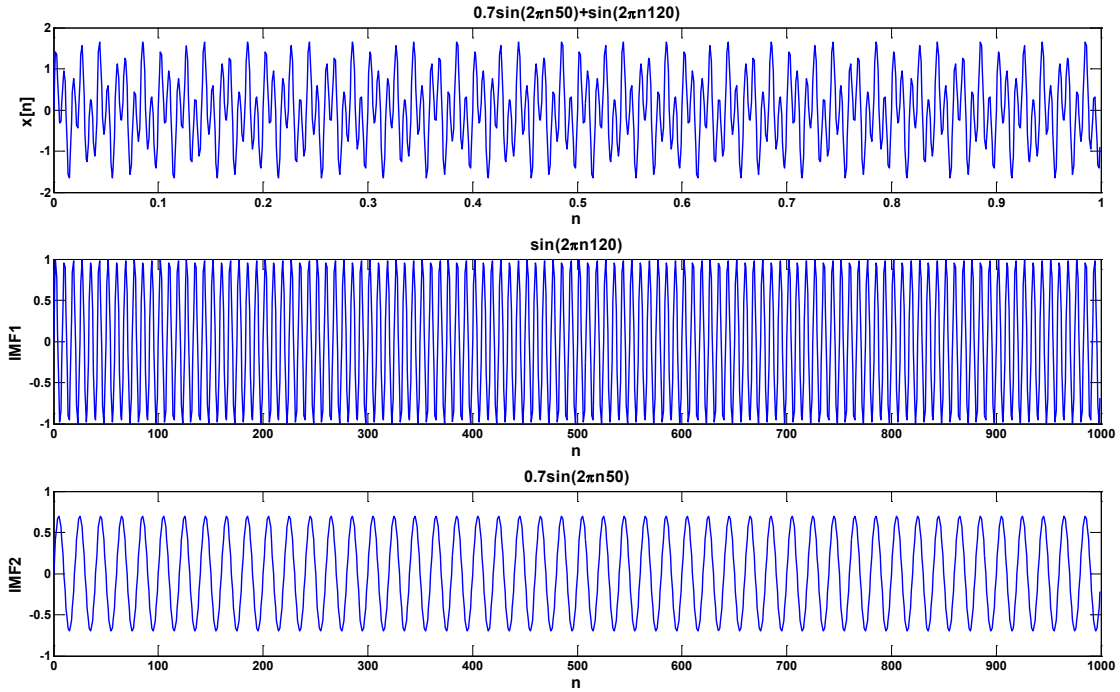
- Modeling the operation of hybrid automates
- Power and energy modeling
- Niggemann's world

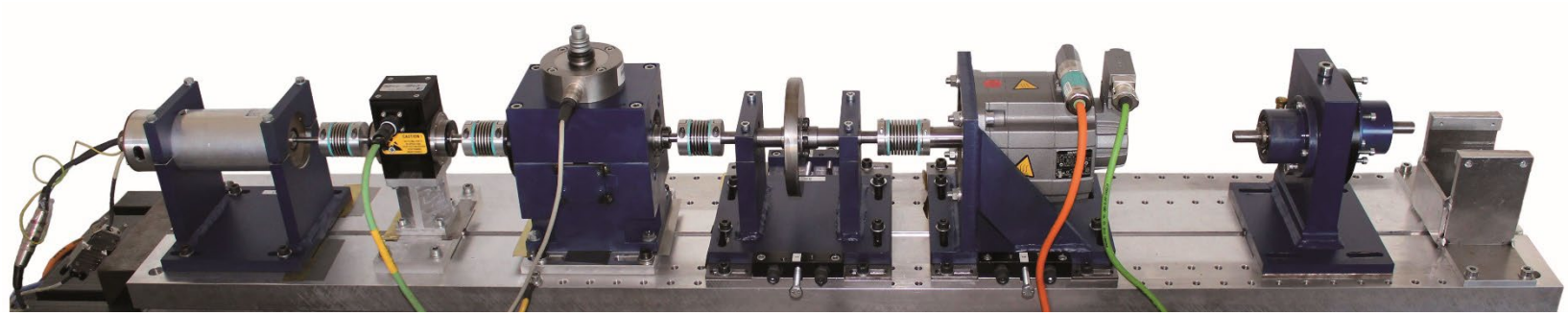




Condition monitoring

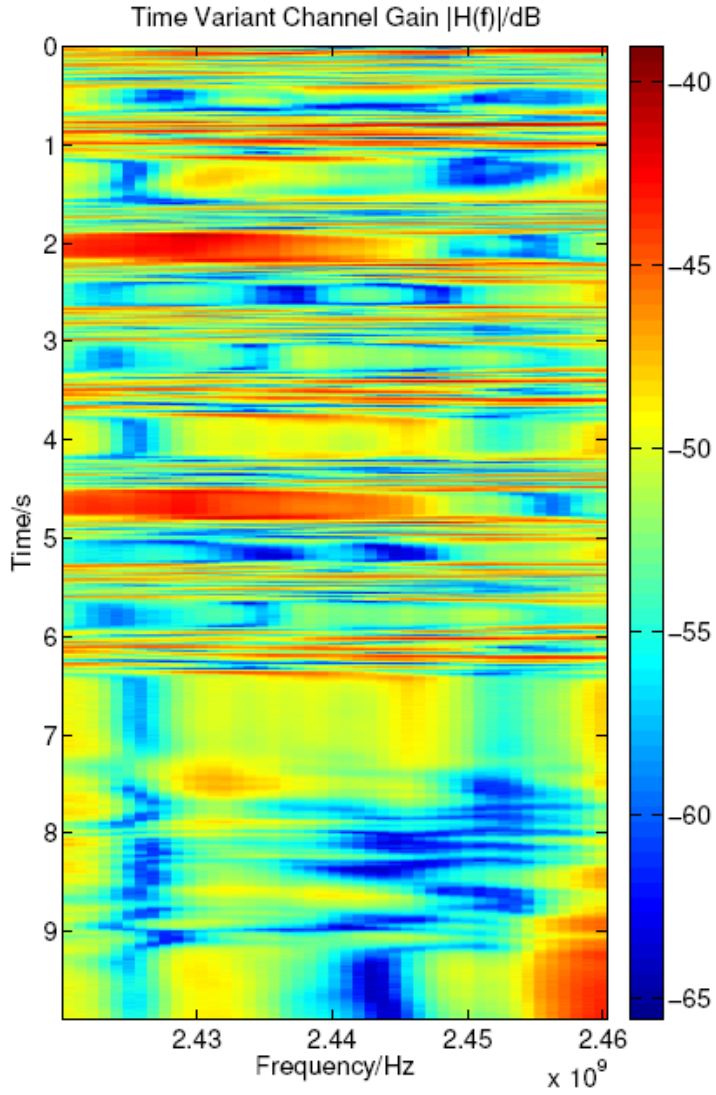
- e.g. “health status” of electrical drives
- check for intrinsic mode functions
- Lohweg's world





Radio channel

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

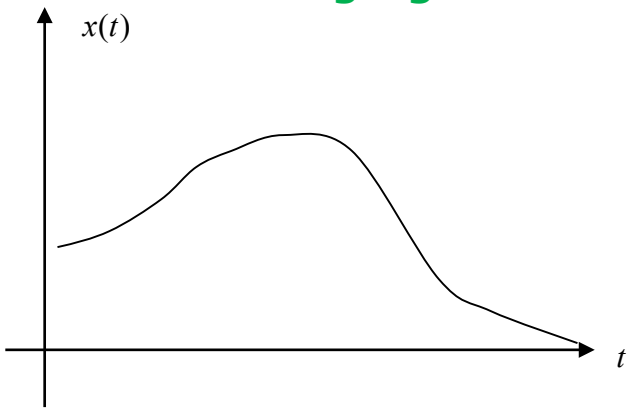


Signal Notation

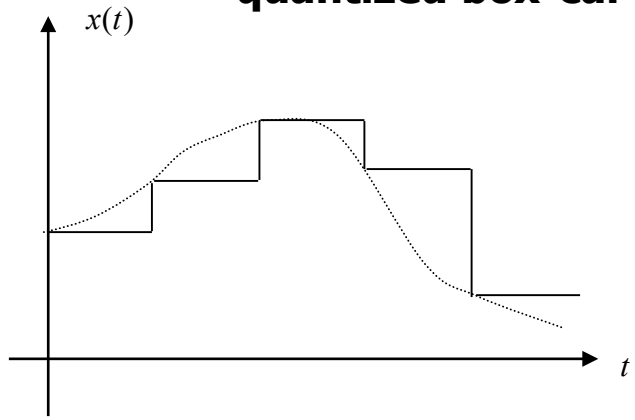
- Signals in this course are mainly considered as **mathematical measures**, i.e. their unit equals one.
- $x, y, X, Y, \ldots$ with **real** or **complex** values
- **Complex-conjugate** notation: $x = a + \mathrm{j}b$, $x^* = a - \mathrm{j}b$

Classification of Signals

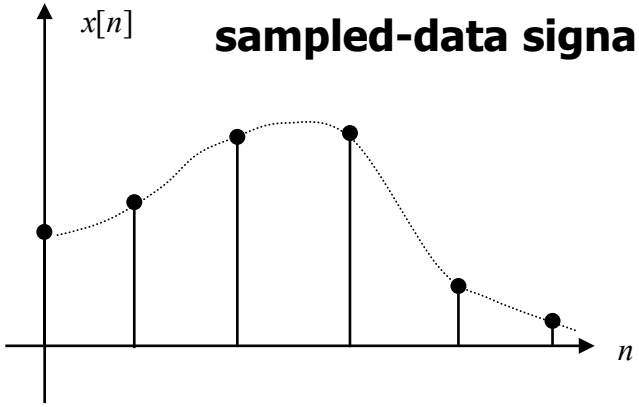
analog signal



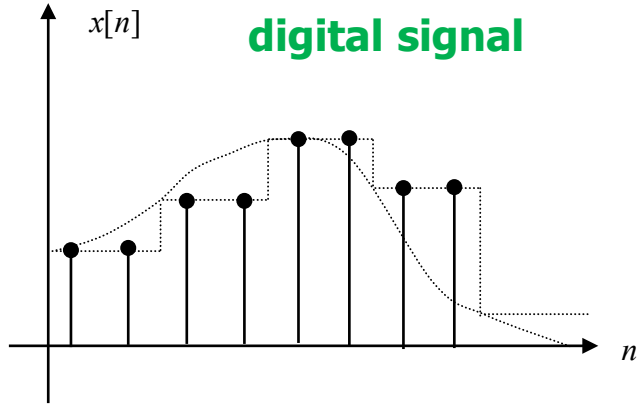
quantized box-car signal



sampled-data signal



digital signal

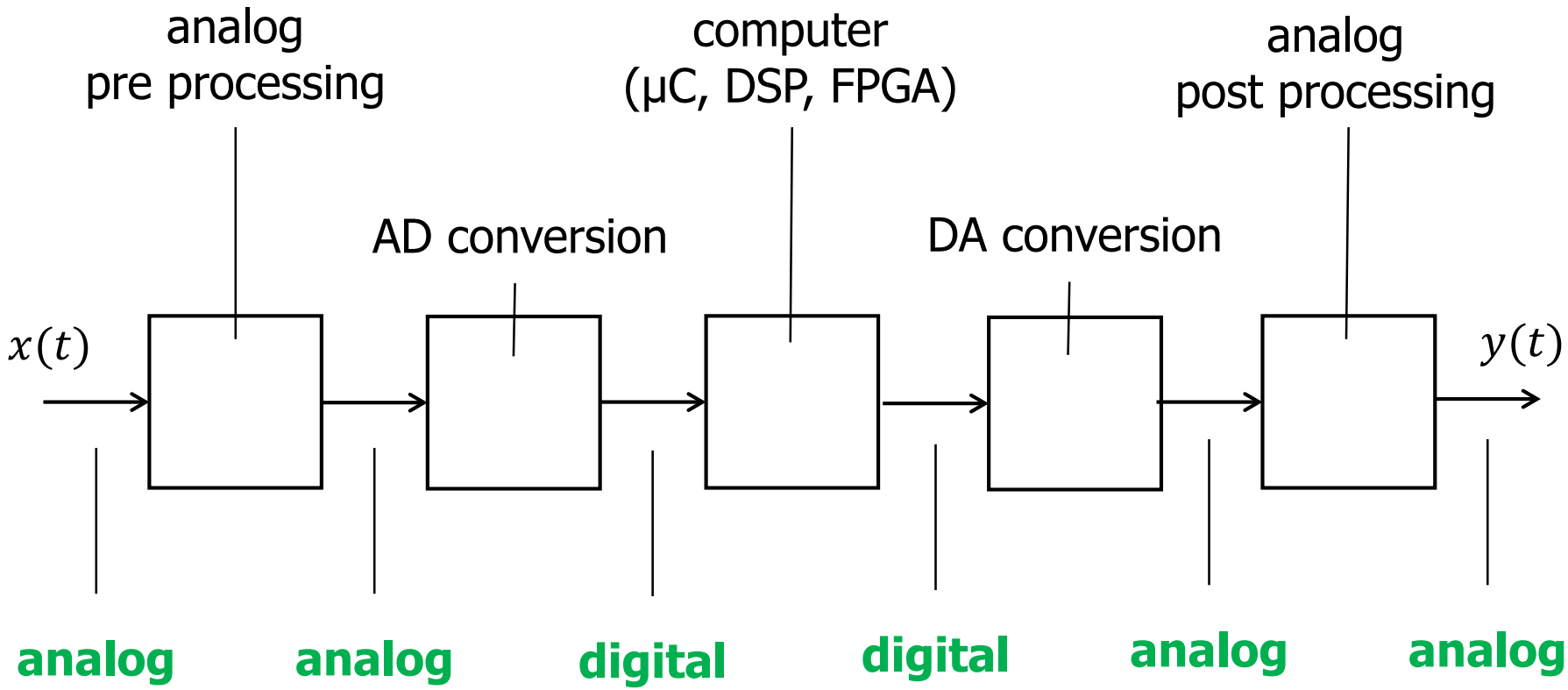


Classification of Signals

- **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

- Only digital signals can be processed by (digital) computers. → **computer-based approach**

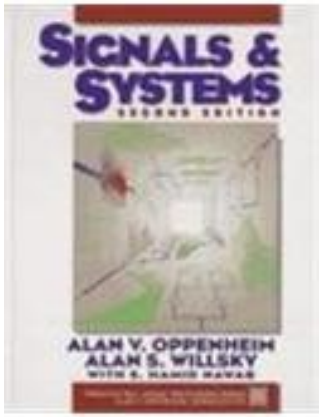
Signal processing



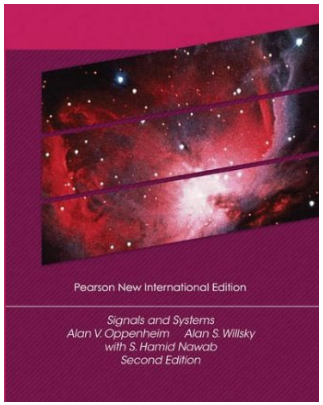
Goals of this course

- 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

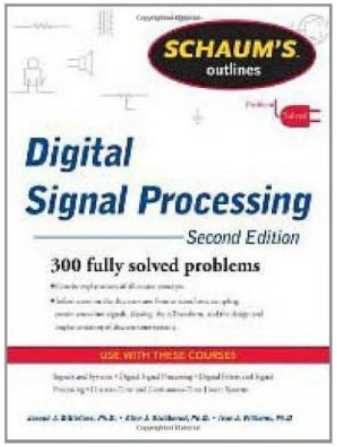


[OPW] Oppenheim, A. V, Willsky, A. S.: Signals and Systems. Prentice Hall, 1997

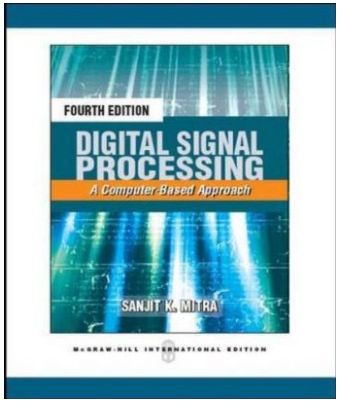


[OPW] Oppenheim, A. V, Willsky, A. S.: Signals and Systems. Pearson Education Limited, 2013

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