Course Diskrete-Time Signals and Systems

Responsible: Prof. Dr. Rainer Bartz

Course

Meets requirements of following modules(MID)

- in active programs
  - Ba ET2012 DSS
  - Ba ET2010 DSS
  - Ba TIN2010 DSS

Course Organization

Version	
created	2013-06-20
VID	1
valid from	WS 2012/13
valid to	

Course identifiers	
Long name	Diskrete-Time Signals and Systems
CID	F07_DSS
CEID (exam identifier)	

Contact hours per week (SWS)	
Lecture	2
Exercise (unsplit)	
Exercise (split)	1
Lab	1
Project	
Seminar	
Tutorial(voluntary)	

Total contact hours	
Lecture	30
Exercise (unsplit)	
Exercise (split)	15
Lab	15
Project	
Seminar	
Tutorial (voluntary)	

Max. capacity	
Exercise (unsplit)	
Exercise (split)	40
Lab	10
Project	
Seminar	

Total effort (hours): 150

Instruction language

- German, 80%
- English, 20%

Study Level

- undergraduate

Prerequisites

- content of F07_ASS
- sequences and series

Textbooks, Recommended Reading

- Carlson, G. E.: Signal and Linear System Analysis, John Wiley & Sons, Inc.
- Girod, B.: Einführung in die Systemtheorie, Teubner Verlag
- von Grünigen, D. Ch.: Digitale Signalverarbeitung, Fachbuchverlag Leipzig
- Hsu, H.P.: Signals and Systems, Schaums Outlines
- Meyer, M.: Signalverarbeitung, Verlag Vieweg
- Ohm, J.-R.; Lüke, H. D.: Signalübertragung, Springer-Verlag
- Oppenheim, A.V.; Wilsky, A.S.:Signals & Systems, Prentice Hall
- Werner, M.: Signale und Systeme, Verlag Vieweg

Instructors

- Prof. Dr. Rainer Bartz
- Prof. Dr. Harald Elders-Boll
- Prof. Dr. Andreas Lohner

Supporting Scientific Staff

- Dipl.-Ing. Martin Seckler
- Dipl.-Ing. Norbert Kellersohn

Transcipt Entry

Diskrete-Time Signals and Systems

Assessment

Type	
wE	written exam

Total effort [hours]	
wE	10

Frequency: 2-3/year

Course components

Lecture/Exercise

Objectives

Contents

- signals
  - Fourier transform (DTFT) of discrete-time signals
    - theorems and examples
  - discrete Fourier transform (DFT)
    - derivation and definition of the DFT (and inverse DFT)
    - resolution in time and frequenzy domain
  - z-transform
    - single-sided z-transform
    - z-transform pairs and theorems
    - initial and final value theorem
    - inverse transform using partial fraction expansion
    - time signal evaluation through power series expansion
    - relationship to DTFT
- systems; signal transmission
  - discrete-time (DT) LTI sytems
    - difference equations and block diagrams
    - DT unit impulse and impulse response
    - DT step and step response
    - DT convolution

        - z-transform of a delay element
        - the z-transfer function
        - pole-zero plot and stability
        - FIR and IIR systems
    - design of DT filter systems
        - canonical system structures: DF1, DF2
        - ideal DT low pass filter
        - design of IIR filter
        - design of FIR filter
        - comparison between FIR and IIR filter

Acquired Skills

- students acquire fundamental knowTTge on theory and applications of discrete-time signals and systems
- they understand the behavior of typical systems
- they can apply algorithms for convolution, Fourier-, and z-transform
- they are able to design a system, to model a system, and to analyze it in time and frequency domain
- they can apply system theory to real-world systems

Operational Competences

- students can implement a discrete-time system basTTn given requirements

Additional Component Assessment

Type	
fAP	(optional) assessTTproblem solving
fSP	supervisTTassisted problem solving

Contribution to course grade	
fAP	(if offerTT)TTrated: 20%
fSP	not rated

Frequency: 1/yTTn

Lab

Objectives

Contents

- sampling input and output signals of a CT system
- basic algorithms of signal processing
- design of a small system from a requirements specification

Acquired Skills

- students can use state of the art tools for system modelling and simulation
- they understand the relationship between CT and DT systems and can explain the most important effects

Operational Competences

- students are able to solve problems in small teams
- they can analyze measurement results and extract knowTTge about the underlying system
- they are able to model and simulate a real-world system
- they can detect a wrong sample rate and adjust it
- they are able to implement basic algorithms of digital signal processing

Additional Component Assessment

Type	
fSC	2-3 lab experiments

Contribution to course grade	
fSC	prerequisite for course exam

Frequency: 1/year