HE1002 Signals and Systems 7.5 credits

Signaler och reglersystem

This is a translation of the Swedish, legally binding, course syllabus.

If the course is discontinued, students may request to be examined during the following two academic years

Establishment

Course syllabus for HE1002 valid from Autumn 2007

Grading scale

A, B, C, D, E, FX, F

Education cycle

First cycle

Main field of study

Electrical Engineering,Technology

Specific prerequisites

Mathematical knowledge corresponding to the course Mathematics 1 HF1901/HN1901.

Language of instruction

The language of instruction is specified in the course offering information in the course catalogue.

Intended learning outcomes

That the student should acquire basic knowledge about mathematical methods for analysis of continuous-time and discrete-time signals and ability to use continuous-time methods within automatic control.

After finishing he course, the students should be able to:

Part 1, transforms.

- Describe and explain basic concepts within transform theory
- Describe the definition and properties of the Laplace transform
- Construct differential equations
- Use the Laplace transform on differential equations
- Use inverse transforms in Laplace theory
- Use the Heaviside, impulse and ramp functions
- Apply damping and speed of response
- Transform derivatives and integrals
- Work on systems of linear differential equations
- Classify systems
- Use transfer and frequency functions
- Determine if a system is stable
- Describe the definition and properties of the z-transform
- Construct difference equations
- Use the z-transform on difference equations
- Use the inverse z-transform
- Describe the definition and properties of the Fourier transform and Fourier series
- Describe periodic functions, trigonometric functions, orthogonal functions, odd and even functions, trigonometric series and Fourier series

Part 2, Control systems

- Describe what is meant by automatic control theory
- Describe dynamic systems using differential equations
- Use the Laplace transform, frequency function and other theoretical concepts from part 1
- Model and indentify complex systems
- Design and reduce block diagrams
- Do transient and frequency analysis on linear continuous-time systems
- Determine properties of feedback systems, like stability, accuracy, speed and robustness
- Dimension control systems using a PID-controller and the Ziegler-Nicholl method
- apply transforms and control theory using a simulation tool

Course contents

Continuous-time systems:

The Laplace transform with transfer functions, poles and root-locus

Fourier series and the Fourier transform

Discrete-time systems:

The Z-transform, transfer functions

Applications: Control systems and feedback systems

Course literature

Literature

LAPLACETRANSFORMER och z-TRANSFORMER, Lars Bergström ,Bertil Snaar, Natura Läromedel

Thomas, Bertil: Modern Reglerteknik, Liber, ISBN 91-47-05085-3

Thomas, Bertil: Modern Reglerteknik, Övningsbok, Liber, ISBN 91-47-05103-5

Examination

- LAB1 - Laboratory Work, 1.5 credits, grading scale: P, F
- TEN1 - Examination, 3.7 credits, grading scale: A, B, C, D, E, FX, F
- TEN2 - Examination, 2.3 credits, grading scale: A, B, C, D, E, FX, F

Based on recommendation from KTH's coordinator for disabilities, the examiner will decide how to adapt an examination for students with documented disability.

The examiner may apply another examination format when re-examining individual students.

Ethical approach

- All members of a group are responsible for the group's work.
- In any assessment, every student shall honestly disclose any help received and sources used.
- In an oral assessment, every student shall be able to present and answer questions about the entire assignment and solution.