Course syllabus

Automationsteknik, fortsättningskurs
Automation, Advanced Course

EIEF20, 7,5 credits, G2 (First Cycle)

Valid for: 2023/24
Faculty: Faculty of Engineering, LTH
Decided by: PLED E
Date of Decision: 2023-04-11

General Information

Compulsory for: IEA3
Language of instruction: The course will be given in Swedish

Aim

The course aims to provide advanced knowledge in control engineering and automation. Areas within the control engineering that is advanced is primarily systems of state space and time discrete systems. Both are important to understand and formulate control algorithms for both simulation and implementation of controllers with microprocessors /computers. A brief introduction to multivariable control theory is also an important complement to previous automatic control skills. The automation part consists of an introduction to the analysis of machine management modeled by time discrete Markov chains. The course includes laboratory and simulation related to state feedback, discrete time control and Markov chains.

Learning outcomes

Knowledge and understanding
For a passing grade the student must

should be able to analyze simpler multivariable control systems

should be able to analyze the control system of the state space

should be able to analyze discrete-time control

should be able to analyze simpler Markov chains

Competences and skills
For a passing grade the student must

will be able to calculate decoupling filter for simpler multivariable systems

will be able to size the state feedback processes from a given specification

will be able to calculate the controllers in discrete-time control systems from a given specification

will be able to develop programs to implement discrete-time controllers

will be able to perform modeling of product flows in simple manufacturing processes using Markov chains

Judgement and approach
For a passing grade the student must

should be able to select an appropriate sampling interval for a discrete-time controller given specification and process characteristics

Contents

State models ands state feedback

Discrete-time systems and Z-transformers

Servo technology

Discrete time Markov chains

Multivariable systems

Decoupling filter for multivariable control

Aliasing effect

Stability criteria for discrete-time systems

Pole placement design for discrete-time controllers

Simple process identification with the least squares method

Examples of medeling with Markov chains in automation

Examination details

Grading scale: TH - (U,3,4,5) - (Fail, Three, Four, Five)
Assessment: Approved laborations and a written exam

The examiner, in consultation with Disability Support Services, may deviate from the regular form of examination in order to provide a permanently disabled student with a form of examination equivalent to that of a student without a disability.

Admission

Admission requirements:

- The compulsory course items of EIEF06 or EIEF05 Automation

Assumed prior knowledge: FMA645, FMAA50 Mathematical analysis, FMF656, FMAA55 Linear Algebra, EIEF06 or EIEF05 Automation and FRT602, EIEF30 Automatic Control
The number of participants is limited to: No

Reading list

- Handouts.
- Bertil Thomas: Modern reglerteknik, Liber, ISBN13: 9789147093236.

Contact and other information

Course coordinator: Mats Lilja, mats.lilja@hbg.lth.se
Course homepage: https://www.lth.se/iea/utbildning/kurser-paa-campus-helsingborg/automationsteknik-fk/