HÖGSKOLAN I GÄVLE

Advanced Digital Control Systems 7.5 cr

Avancerad digital styrning 7,5 hp

Set by Faculty of Engineering and Sustainable Development

Version	**Set at**	**Valid from**
	10/11/13	**HT2015**

Level	A1F
Education level	Second cycle
Course identifier	EEA303
Credits	7.5 cr
Main field of study	Electronics
Subject group	Electronics
Disciplinary domain	Technology 100.0 %

Learning outcomes

The purpose of this course is to give the student deep theoretical and practical knowledge of modern advanced digital control systems and how they are used in real applications.

After completion of the course the student shall be able to
1. describe the structure and principles of digital control systems
2. analyse detailed characteristics of digital control systems using mathematical and heuristic methods
3. design suitable controller strategies using a variety of approaches to meet required control system specifications
4. describe, design and implement a variety of real-time control strategies
5. carry out observations, perform calculations and evaluate the results from experimental computer controlled systems using an appropriate software
6. design and perform implementations of on-line modelling and model-based control solution strategies on real control systems
7. critically read, analyze a set of research papers related to digital control systems, summarise the content of the papers and make overall reflections in a written report, and present the report in a seminar.

Course content

- Overview of digital control systems

- Analysis of digital systems: transfer function, state space, stability, root locus in the z domain
- Modelling control systems: Batch and recursive least squares, real-time modelling of an experimental control system
- Traditional digital controller design methods: pole placement, observers, digital optimal control
- Novel digital control design methods: fuzzy logic, neural network based controllers and evolutionary methods for designing control strategies
- Adaptive control: Self-tuning model-based control of an experimental system in real-time
- Research, development and trends concerning modern advanced digital control systems.

Teaching

Lectures, practicals and a literature study
- Assignment 1: Matlab analysis of control systems and controller design via several methods and compare results
- Assignment 2: Batch and recursive modelling of experimental time varying systems
- Assignment 3: Real-time modelling and model-based control of an experimental control system

Prerequisites

Multivariable and Nonlinear Control Systems 7.5 hp and Statistical Signal Processing 7.5 hp or equivalent.

Examination

Written examination, assignment (written report and presentation at a seminar) and laborations.

Grade

A, B, C, D, E, Fx, F

Limitations

Each time the course is given there is one ordinary written examination and one re-examination.
Lab assignments and other mandatory assignments are graded E, Fx or F

Other regulations

Criteria for final grade will be given at the beginning of the course.

Sustainable environment

Content with sustainable development is not relevant to this course.

Module

0010 Written examination	4 cr	Grade: AF
0020 Literature study, written report and presentation at seminar	1 cr	Grade: UG
0030 Laboratory exercises	2.5 cr	Grade: UG