SYLLABUS

Automatic Control 7.5 credits R7003E

Reglerteknik

Course syllabus admitted: Autumn 2023 Sp 1 - Present

DECISION DATE
2023-02-15

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LULEÅ TEKNISKA UNIVERSITET

Automatic Control 7.5 credits R7003E

Reglerteknik

Second cycle, R7003E

Education level	Grade scale	Subject	Subject group (SCB)
Second cycle	G U 3 4 5	Reglerteknik	Automation Technology

Main field of study

Maintenance Engineering, Computer Science and Engineering

Entry requirements

Knowledge in the subject of Automatic control. Concepts such as transfer function, Bode plot, poles and zeros, impulse response and step response, feedback and PID controllers should be known. Knowledge on the Laplace transform and experience with Matlab is also presumed. These prerequisites correspond to one of the courses R0001E Basic Automatic Control, R0002E - Modelling and Control 7.5 credits, R0004E Modeling and Control 7.5 credits or R0005E - Measurement and Control 7.5 credits.
Good knowledge in English equivalent to English 6.
Alternative:
Corresponding knowledge obtained through work in the process industry or the electronics industry which is proven by a certificate of professional experience.

Selection

The selection is based on 30-285 credits

Course Aim

The course aim is for students to acquire in-depth knowledge of feedback systems, their design and their use in control engineering applications.

The students should be able to:

- demonstrate broad knowledge of control engineering methods and terminology.
- demonstrate broad knowledge of mathematical methods to analyze dynamic systems
- use standard methods for designing and analyzing controllers.
- demonstrate an ability to, in a group, simulate , analyze , evaluate and implement controllers for a real process and to report on this work, both orally and in writing
- demonstrate the ability to identify constraints of simple controllers and the need for more advanced methods.
- show insight into how the use of automatic control can contribute to sustainable development through reduced consumption of resources .

Contents

Automatic Control is the Science of controlling processes. A typical example of is the cruise control in a car. In this case the car is the \"process\" and the cruise controller varies the throttle lever (\"input signal\") in order to maintain constant speed (\"output signal\") despite slopes and wind gusts (\"disturbance\"). Other common examples can be found in the process industry, where common tasks are to control pressure and temperature, and in communication where it is desirable to control data rates and transmitted power. Control theory is, however, not limited to technical systems but may also be applied in e.g. economy and medicine. Automatic control is generally used for maintaining quality while minimizing consumption of resources such as energy or raw material. This is our standard course in Automatic Control and covers the most common classical methods for analysis and design of feedback control systems for a broad spectrum of technical processes. The course provides detailed knowledge on the subject, sufficient for non-specialists, and gives a broad and necessary base for further studies in the subject.

The course focuses on three main topics:

- state-space systems: linearization and transformations from continuous-time to discrete-time
- state-space feedback control of continuous-time, linear and time invariant systems
- digital control, i.e., control of discrete-time systems;

To confirm the theoretical knowledge obtained during the course, laboratory work is performed on an experimental setup, e.g. a model of an overhead crane or a small-scale Segway.

Realization

Each course occasion´s language and form is stated and appear on the course page on Luleå University of Technology's website.
The teaching is partly conducted in a flipped-classrom style with problem seminars but also with traditional lectures. The achieved knowledge will be directly applied in lab work and project assignments on an experimental setup in the form of a mini-Segway that will be made available to the students during the course. This work is performed in groups of no more than three students and accounted for with written reports and a final demonstration.

Examination

If there is a decision on special educational support, in accordance with the Guideline Student's rights and obligations at Luleå University of Technology, an adapted or alternative form of examination can be provided.
Written exam with differentiated grades and approved lab work.

Unauthorized aids during exams and assessments

If a student, by using unauthorized aids, tries to mislead during an exam or when a study performance is to be assessed, disciplinary measures may be taken. The term “unauthorized aids” refers to aids that the teacher has not previously specified as permissible aids and that may assist in solving the examination task. This means that all aids not specified as permissible are prohibited. The Swedish version has interpretative precedence in the event of a conflict.

Overlap

The course R7003E is equal to SMR057

Course offered by

Department of Computer Science, Electrical and Space Engineering

Modules

Code	Description	Grade scale	Cr	Status	From period	Title
0002	Laboratory work	U G#	3	Mandatory	A07	
0004	Written exam	G U 3 4 5	4.5	Mandatory	A21	

Study guidance

Study guidance for the course is to be found in our learning platform Canvas before the course starts. Students applying for single subject courses get more information in the Welcome letter. You will find the learning platform via My LTU.

Last revised

by Robert Brännström 2023-02-15

Syllabus established

by the Department of Computer Science and Electrical Engineering 2007-02-28