Dynamic Systems 7.5 credits R7016E

Dynamiska system

Course syllabus admitted: Autumn 2023 Sp 1 - Present

DECISION DATE
2021-02-16

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Dynamic Systems 7.5 credits R7016E

Dynamiska system

Second cycle, R7016E

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

Main field of study

Engineering Physics and Electrical Engineering

Entry requirements

Basic knowledge of physics, specifically mechanics, electric circuits and thermodynamics. Knowledge of mathematics, including linear algebra, differential equations, recurrence equations and the Laplace transform. These prerequisite knowledge correspond to F0004T Physics 1, M0031M Linear Algebra and Differential Equations, and one of M0018M Linear analysis, R0001E Basic automatic control, or R0002E Modeling and control.

Knowledge in English, equivalent to English 6.

Selection

The selection is based on 30-285 credits

Course Aim

After completing the course the student should be able to:

- Set up first principles models for basic mechanical, electrical, thermal, and fluid flow systems
- Set up first principles models for other types of systems, such as chemical, biologic, economic, and sociologic, given a description of the system mechanisms.
- Analyze dynamic systems regarding properties such as equilibrium, stability, oscillations, and chaotic behavior
- Implement simulation models for dynamic systems of different kinds, such as ordinary differential equation, partial differential equations, discrete-time systems, differential algebraic systems

Contents

- Dynamic models for electric circuits, mechanical translation, rotation and for thermal and fluid flow systems
- Some examples of models for chemical, biological, economic, sociologic, and population systems.
- Phase portraits of dynamic systems
- Stability analysis: Equilibrium, Introduction to Lyapunov stability, the circle criterion
- Oscillation analysis: Poincare maps, Describing function
- Introduction to chaotic behavior
- Simulation of dynamic systems: Numerical solution of differential equations and differential-algebraic systems. Step length and stiffness

Realization

Each course occasion´s language and form is stated and appear on the course page on Luleå University of Technology's website.
Lectures and group exercises on modeling and analysis of dynamic systems. Lab work on implementation and simulation of dynamic systems in software.

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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. The examination consists of written exam with differentiated grades and written and oral reporting of 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.

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	A20	
0003	Written exam	G U 3 4 5	4.5	Mandatory	A21	

Last revised

by Jonny Johansson, HUL SRT 2021-02-16

Syllabus established

by Jonny Johansson, HUL SRT 2020-02-21

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