

# Hydraulic Servo Systems

Programme course

6 credits

Hydrauliska servosystem

TMHP51

Valid from: 2021 Spring semester

**Determined by**

Board of Studies for Mechanical  
Engineering and Design

**Date determined**

2020-09-29

## Main field of study

Mechanical Engineering

## Course level

Second cycle

## Advancement level

A1X

## Course offered for

- Master's Programme in Mechanical Engineering
- Mechanical Engineering, M Sc in Engineering

## Prerequisites

Fluid power systems, Automatic Control

## Intended learning outcomes

This course intends to give a detailed knowledge in hydraulic servo systems and its applications. The contents of the course covers both the mobile and industrial areas and their different characteristics. After completing the course the student is expected to

- understand the function and characteristics of hydraulic servo components
- be able to apply calculation methodology for component selection and system design
- be able to model and implement dynamic analyzes of closed loop hydraulic servo systems regarding performance, controllability and energy consumption
- be able to analyze measurements on components and systems

## Course content

Extended theory on orifices, flow forces on valve elements and fluid physical properties. Modelling and simulation technology. Mathematical modelling of component and system dynamics. Control engineering analysis. Simulation of fluid systems dynamics. Proportional and servo valve designs and characteristics of different pilot and power stages. Servo systems for control of position, velocity and force. Multi-axis loads. Control strategies and dynamic characteristics. Sensor technologies and measurement methods for components specific to hydraulic servo systems.

## Teaching and working methods

The teaching consists of lectures, lessons and laboratory exercises. Educational study visits are made to different industries.

## Examination

UPG2	Hand-in assignment	2 credits	U, G
TEN3	Written examination	3 credits	U, 3, 4, 5
LAB3	Laboratory work	1 credits	U, G

## Grades

Four-grade scale, LiU, U, 3, 4, 5

## Other information

### Supplementary courses

TMMS10 - Fluid Power Systems and Transmissions  
TMMS13 - Electro Hydraulic Systems  
TMPMo6 - Project Course Advanced - Mechatronics

### About teaching and examination language

The teaching language is presented in the Overview tab for each course. The examination language relates to the teaching language as follows:

- If teaching language is Swedish, the course as a whole or in large parts, is taught in Swedish. Please note that although teaching language is Swedish, parts of the course could be given in English. Examination language is Swedish.
- If teaching language is Swedish/English, the course as a whole will be taught in English if students without prior knowledge of the Swedish language participate. Examination language is Swedish or English (depending on teaching language).
- If teaching language is English, the course as a whole is taught in English. Examination language is English.

### Other

The course is conducted in a manner where both men's and women's experience and knowledge are made visible and developed.

The planning and implementation of a course should correspond to the course syllabus. The course evaluation should therefore be conducted with the course syllabus as a starting point.

## Department

Institutionen för ekonomisk och industriell utveckling

## Director of Studies or equivalent

David Lundström

## Examiner

Magnus Sethson

## Education components

Preliminary scheduled hours: 54 h

Recommended self-study hours: 106 h

## Course literature

### Compendia

J-O Palmberg, Analys och syntes av en tryckregulator

Krus P, Introduction to Transmission Line Dynamics

Palmberg J-O, Tryckstyrning

Rydberg K-E, Feedbacks in Hydraulic Servo Systems

Rydberg K-E, Hydraulic Servo Systems - Theory and Applications

Rydberg K-E, Hydraulic Systems with Load Dynamics

### Other

*Formula Book for Hydraulics and Pneumatics*