

# Hydraulic Servo Systems

Programme course

6 credits

Hydrauliska servosystem

TMHP51

Valid from: 2018 Spring semester

**Determined by**  
Board of Studies for Mechanical  
Engineering and Design

**Date determined**

## Main field of study

Mechanical Engineering

## Course level

Second cycle

## Advancement level

A1X

## Course offered for

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

## Entry requirements

Note: Admission requirements for non-programme students usually also include admission requirements for the programme and threshold requirements for progression within the programme, or corresponding.

## 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

- have knowledge about component functionality and characteristics in the area of hydraulic servo systems.
- have knowledge about calculation methods and selection of components in high performance hydraulic servo systems
- have knowledge about control principles and control engineering methods with focus on controllability, stability and energy consumption of hydraulic servo systems
- have knowledge in measurement methods and computer usage for control and monitoring of hydraulic servo systems.
- be able to model and analyse hydraulic servo systems with respect to performance, controllability and energy consumption.
- be able to apply calculation methods for component selections and system design.
- be able to perform 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

UPG1	Hand-in assignment	0.5 credits	U, G
LAB1	Laboratory Work	1.5 credits	U, G
TEN2	Written examination	4 credits	U, 3, 4, 5

## Grades

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

## Other information

### Supplementary courses

TMMS10 - Fluid Power Systems and Transmissions  
TMMS13 - Electro Hydraulic Systems  
TMPM06 - Project Course Advanced - Mechatronics

## Department

Institutionen för ekonomisk och industriell utveckling

## Director of Studies or equivalent

Mikael Axin

## 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*