Aalto University
School of Engineering

MEC-E5003

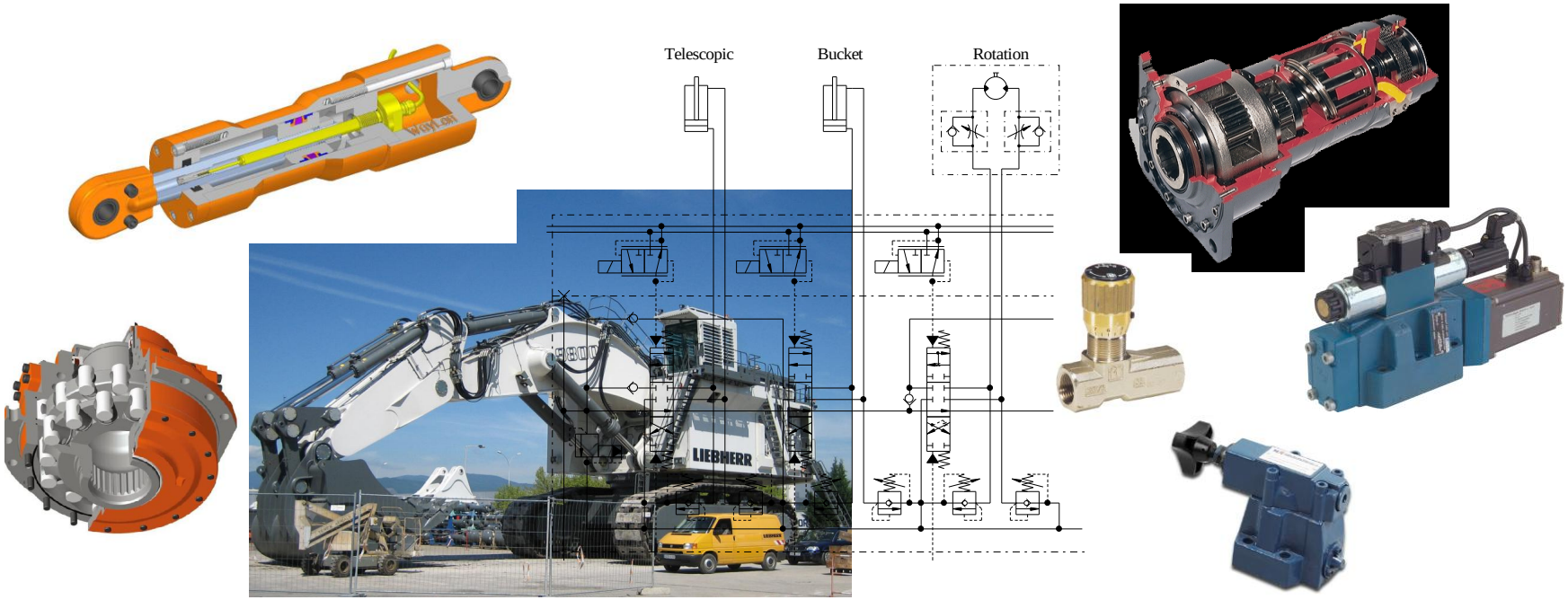
FLUID POWER BASICS

Study Year 2018 - 2019

Lecturer: DSc (Tech) Jyrki Kajaste

Course objectives

Course provides general knowledge of fluid power (hydraulics and pneumatics) components and their operation as a part of the system.



Learning outcomes (1/2)

After the course the student is able to

- Describe technical fundamentals of hydraulic and pneumatic systems
- Describe general characteristics of different pressure media
- Analyse the behaviour of pressure and flow in hydraulic and pneumatic systems
- Describe the operation and control of hydraulic and pneumatic components, the factors affecting the operation, and the effect of the components on the system

Learning outcomes (2/2)

After the course the student is able to

- Analyse and calculate the characteristics, properties and operation of hydraulic and pneumatic systems
- Analyse diagrams of hydraulic and pneumatic systems
- Use firmware/software packages to calculate and analyse hydraulic and pneumatic systems and to draw up diagrams
- Build simple hydraulic and pneumatic systems
- Document hydraulic and pneumatic systems

Course arrangements

Lectures

- Mondays & Thursdays

Obligatory part

- 3 Research Assignments (90% of the course grade altogether)
  - Ÿ group works (groups of 3-4 people)
  - Ÿ two (2) laboratory exercises (hydraulics & pneumatics), groups
- 1 simulation assignment (Simulink Simscape, 10% of the course grade altogether)

Voluntary part

- Calculation Exercises 6 (hydraulics), Fridays, first one on 18.1.2019
  - Ÿ Two exercises are Controlled Exercises (~exams), from which it is possible to earn extra points over the points earned from the Research Assignments
  - Ÿ Advice for the next Research Assignment tasks given!

Schedule, v. 1

Preliminary!

Week	weekday	day	time	class	event	week	laboratory exercises	assignment dead lines
2	Monday	7.1.	12:15-14:00	326	lecture	2		
	Thursday	10.1.	14:15-16:00	202	lecture	2		
3	Monday	14.1.	12:15-14:00	326	lecture	3		
	Thursday	17.1.	14:15-16:00	202	lecture	3		
	Friday	18.1.	12:15-14:00	326	exercise 1	3		Ecercise 1 out
4	Monday	21.1.	12:15-14:00	326	lecture	4		
	Thursday	24.1.	14:15-16:00	202	lecture	4		
	Friday	25.1.	12:15-14:00	326	exercise 2	4		
5	Monday	28.1.	12:15-14:00	326	lecture	5	Hydraulics	
	Thursday	31.1.	14:15-16:00	202	lecture	5		**Exercise 1 deadline**
6	Monday	4.2.	12:00-14:00	Maari C-D	simulation exercise	6		Exercise 2 out
	Thursday	7.2.	14:00-16:00	Maari C-D	simulation exercise	6		Simulation A out
	Friday	8.2.	12:15-14:00	326	**controlled exercise 3**	6		
7	Monday	11.2.	12:00-14:00	Maari C-D	simulation exercise	7		
	Thursday	14.2.	14:00-16:00	Maari C-D	simulation exercise	7		Simulation B out
	Friday	15.2.	12:15-14:00	326	exercise 4	7		
8	ASSESSMENT & EXAMINATION WEEK					8		
9	Monday	25.2.	12:15-14:00	326	lecture	9	Pneumatics	
	Thursday	28.2.	14:15-16:00	215	lecture	9		**Exercise 2 deadline**
	Friday	1.3.	12:15-14:00	215	exercise 5	9		
10	Monday	4.3.	12:15-14:00	326	lecture	10		
	Thursday	7.3.	14:15-16:00	216	lecture	10		**Simulation A and B deadline**
	Friday	8.3.	12:15-14:00	326	**controlled exercise 6**	10		Exercise 3 out
11	Monday	11.3.	12:15-14:00	216	lecture	11		
	Thursday	14.3.	14:15-16:00	326	lecture	11		
12	Thursday	21.3.				12		**Exercise 3 deadline**

SIMULATION

Research Assignments

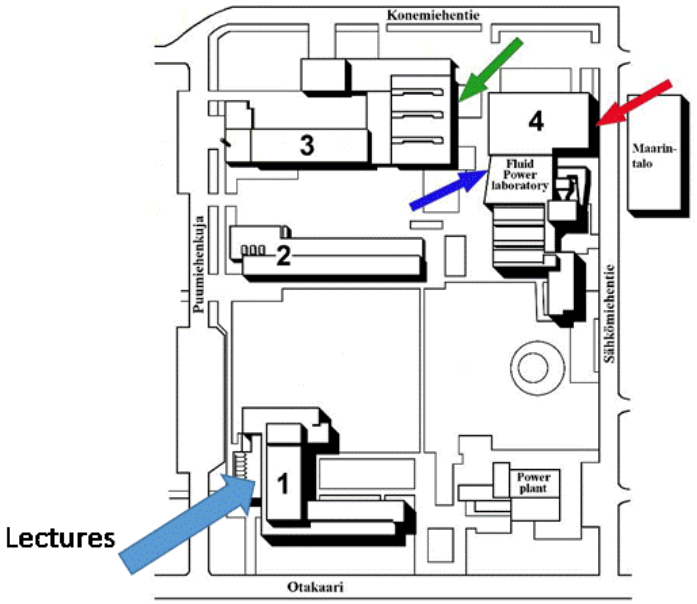
- mainly calculation problems
- two laboratory exercises
- sources: course material, other literature, internet
- groups' self-assessment and feedback from assignment

Support

- guidance is available in the lectures and calculation exercises
- diagram drawing: hydraulic symbols for MS Visio are downloadable in MyCourses -page where are also listed links to other diagram drawing software
- Automation Studio -"simulation" software is available in ICT classes A046a and A046b (located in the cellar of A-wing of the main building of Aalto University). Unfortunately only three program licences are available

Laboratory Exercises

- Hydraulics
- Pneumatics
- done in Research Assignment groups
- optional dates/times in WebOodi
- both exercises include a preliminary task (described in Research Assignments)



Study material

Hydraulics

- TBA
- (In Finnish; Kauranne - Kajaste - Vilenius: Hydraulitekniikka)
- lecture slides in MyCourses

Pneumatics

- TBA
- (In Finnish: Ellman - Hautanen - Järvinen - Simpura: Pneumatiikka)
- lecture slides in MyCourses

Calculation Exercises

- material in MyCourses

E-Communication

MyCourses

- general course arrangements, discussions and instructions
- course material
- submitting the Research Assignment Reports
- status of the studies (submitted reports, earned points etc.)

WebOodi

- dates and times of education events
- registrations (obligatory!) for course and Laboratory Exercises

Email

- if needed, personal/group-specific announcements concerning exercises
- informing about sudden cancellations or changes in teaching events