

Pneumatics and Hydraulics

Code: MK3PNEUR04G117-EN

ECTS Credit Points: 4

Evaluation: mid-semester grade

Year, Semester: 2nd year, 2nd semester

Its prerequisite(s): Basics of Mechatronics

Further courses are built on it: Yes/No

Number of teaching hours/week (lecture + practice): 0+4

Topics:

Preparation of compressed air. Application of pneumatic working and control elements. Use of way valves, closing and flow control elements. Pneumatic implementation of logical basic functions, counters and timers. Application and implementation of the standard symbol system of pneumatic elements and switches. FluidSIM-P program use. Hydraulic power generation, hydraulic energy converters and their operation. Physical concepts and hydraulic calculations, power and efficiency. Use of hydraulic working and control elements. Directional valves, closing and flow control elements, pressure regulators, sliding and seat elements. Instrumentation measurements and measuring circuits. Use of piping sections, hoses, oil filters. Application and implementation of a standard symbol system for hydraulic elements. FluidSIM-H program use. Energy saving applications.

Literature:

Compulsory:

- D. Merkle, B.Schrader, M. Thomes: Hydraulics Basic Level Festo Didactic GmbH and Co., 2003.
- Peter Croser, Frank Ebel: Pneumatics Basic Level Festo Didactic GmbH and Co., 2002.

Recommended:

- De Silva, Clarence W.: Mechatronics: an integrated approach CRC Press, 2005.

Schedule

1st week Registration week

2nd week:

Practice: Development of pneumatics. Compressed air properties. Pneumatic equipment economy. State equation of gases.

4th week:

Practice: Pneumatic actuators (structure cylinder, rotary actuators, sizing cylinders).

6th week:

Practice: Basic circuit (single- and double acting cylinder controlling, control with And- Or elements, increase speed)

3rd week:

Practice: Compressed air production. Compressed air supply. Compressed air preparation.

5th week:

Practice: Generally about valves (way-, closing-, pressure managing-, stop-, time-).

7th week:

Practice: Functions of hydraulic equipment. Symbols and drawing techniques.

8th week 1st drawing week, 1st Mid-term test

9th week:

Practice: Structure and circuit diagrams (control, power supply) of hydraulic systems.

10th week:

Practice: Physical basics of hydraulics (pressure transmission, force transmission, way transmission,

pressure ratio). Kind of flows.

11th week:

Practice: Equipment representation (layout drawings, wiring diagrams, operating charts). Power supply system components (gear motor, pump, filter, tank).

13th week:

Practice: Shut-off valves (check valve, controlled check valve). Flow control valves (one way control valves, 2 way flow control valve).

12th week:

Practice: Valves (method of construction, the nominal value, slide). Pressure control valves. Way valves (2/2, 3/2, 4/2, 4/3).

14th week:

Practice: Hydraulic cylinders (single, double acting, sealing, venting, buckling). Hydraulic motors.

15th week 2nd drawing week, 2nd Mid-term test

Requirements

A, for a signature:

Participation at practice classes is compulsory. A student must attend the practice classes and may not miss more than three times during the semester. In case a student does so, the subject will not be signed and the student must repeat the course. A student can't make up a practice class with another group. Attendance at practice classes will be recorded by the practice leader. Being late is equivalent with an absence. Missed practice classes must be made up for at a later date, being discussed with the tutor. Active participation is evaluated by the teacher in every class. If student's behaviour or conduct doesn't meet the requirements of active participation, the teacher may evaluate his/her participation as absence because of the lack of active participation in class.

B, for a grade:

Students have to fulfil a mid-term exercise at least for 50% to take part on the next practice classes. All students, who failed the mid-term exercise will not get a mid-semester grade. At the end of the semester, all students have to solve a real life problem in programming. Also a task, to make a complete documentation of the project file, using all the methods, mentioned during the semester. The course ends in a mid-semester grade. Based on the average of the grades of the tasks. The grade for the test is given according to the following table: Score Grade 0-50 fail (1) 51-65 pass (2) 66-75 satisfactory (3) 76-85 good (4) 86-100 excellent (5)