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| **Mechatronics II.**  |

**Code: MFMHT32R06-EN**

**ECTS Credit Points: 6**

**Evaluation: mid-semester grade**

Year, Semester: 3rd year/1st semester

Number of teaching hours/week:

Lecture: **1**

Practice: **2**

**Prerequisites:** Mechatronics I: MFMHT31R04-EN

**Topics**:

Hydraulic machine functions. Design of hydraulic systems and circuit diagrams. Physical principles of hydraulics. Parts of power supply systems. Pressure control valves. Stop valves. Flow control Valves. Hydraulic cylinders. Electro hydraulic controls. Electrical basics. Electro-hydraulic circuits. A signal storage path-dependent overthrow control. Processes to hydraulic PLC control.

D. Merkle, B.Schrader, M. Thomes: Hydraulics Basic Level, Festo Didactic GmbH & Co., D-73770 Denkendorf 2003

Dieter Scholtz: Electrohidraulics Basic Level, Festo Didactic GmbH & Co., D-73770 Denkendorf 2001

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

**Schedule**

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| **1st week:****Lecture:** Functions of hydraulic equipment. Symbols and drawing techniques.**Practice:** General description about laboratory regulations. Accident prevention and safety education.**2nd week:** **Lecture: S**tructure and circuit diagrams (control, power supply) of hydraulic systems.**Practice:** Understanding of physical elements. Technical description of drawing symbols.**3rd week:****Lecture:** Physical basics of hydraulics (pressure transmission, force transmission, way transmission, pressure ratio). Kind of flows. Working fluid (types of tasks, viscosity).**Practice:** Actuator elements operation in real environments and Fluid SIM software. Exercises on bending machines.**4th week:****Lecture:** Equipment representation (layout drawings, wiring diagrams, operating charts). Power supply system components (gear motor, pump, filter, tank).**Practice:** Operation actuator elements via indirect valves. Exercises on roller tracks. | **5th week:****Lecture:** Valves (method of construction, the nominal value, slide). Pressure control valves. Way valves (2/2, 3/2, 4/2, 4/3).**Practice:** Implementation of complex control exercises in real environment and Fluid SIM software. Lift table exercise. Exercises on lidded containers.**6th week:****Lecture:** Shut-off valves (check valve, controlled check valve). Flow control valves (one way control valves, 2 way flow control valve).**Practice:** Exercises on paint drying furnaces. Exercises on holders. Exercises on hydraulic tilting platforms.**7th week:****Lecture:** Hydraulic cylinders (single, double-acting, sealing, venting, buckling). Hydraulic motors.**Practice:** Exercises on turning machine feeding. Exercises on grinding machines. and drill machines.**8th week:****Mid-term test****9th week:****Lecture:** Electrical symbols. Electro-hydraulic controls. (hydraulic, electrical diagram, function graphs)**Practice:** Understanding electro-hydraulic devices. Exercises on sawing machines. |
| **10th week:****Lecture:** Electro-hydraulic structure of equipment. Electrical basic concepts.**Practice:** Exercises on lifting stations. and conveyor belt.**11th week:****Lecture:** Electrical components. Electro-hydraulic circuits (And, Or, Xor).**Practice:** Exercises on press machines.**12th week:****Lecture:** Electro-hydraulic circuits (signal storage way control).**Practice:** Exercises on glue devices and furnace door control. | **13th week:****Lecture:** Electro-hydraulic circuits (falling edge automatic mode).**Practice:** Exercises on trimmer machines. Exercises on unit lifting.**14th week:****Lecture:** Hydraulic processes control by PLC.**Practice:** Exercises on auto assembly. **15th week:****End-term test** |

**Requirements**

**A, for a signature:**

Attendance at **lectures** is recommended, but not compulsory.

Participation at **practice classes** is compulsory. Students 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. Student can’t make up a practice class with another group. Attendance at practice will be recorded by the practice leader. Being late is counted as an absence. In case of further absences, a medical certificate needs to be presented. Missed practices should be made up for at a later date, being discussed with the tutor. Students are required to bring the necessary utensils (e.g. calculator) for the course to each practice class. Active participation is evaluated by the teacher in every class. If a student’s behavior or conduct doesn’t meet the requirements of active participation, the teacher may evaluate his/her participation as an absence due to the lack of active participation in class.

During the semester there are two tests: the mid-term test in the 8th week and the end-term test in the 15th week. Students have to sit for the tests.

**B, for a grade:**

The course ends in a **mid-semester grade (AW5)**. Based on the average of the marks of the drawings and the average of the test results, the mid-semester grade is calculated as an average of them:

* the average grade of the two tests

The minimum requirement for the mid-term and end-term tests is 60%. Based on the score of the tests separately, the grade for the tests is given according to the following table:

Score Grade

0-59 fail (1)

60-69 pass (2)

70-79 satisfactory (3)

80-89 good (4)

90-100 excellent (5)