

SYLLABUS: PNEUMATICS AND HYDRAULICS

Date / Revision August 22, 2017 / 22.08.17 /MaS
Faculty Engineering
Study Programm Mechatronics

SUBJECT: Pneumatics and Hydraulics

1 Basic Information

1.01	Subject Name	Pneumatics and Hydraulics
1.02	Semester	6
1.03	Level	1
1.04	SKS	3
1.05	Mandatory / Curriculum	Mandatory / D-12
1.06	Subject Code	PNEM
1.07	Subject Code	MTE-D-PNEM-6112
1.08	Year	2017 (7)
1.09	Quality Control	Final Test, see evaluation
1.10	Limitations	Min 12 and Max 32 students in one class
1.11	Combined with	MEE, ELE
1.12	Perquisite	Mechanical-, Electronics, Sensor, PLC, Automations
1.13	Responsible	Dean of Engineering Faculty
1.14	Revision	22-08-2017/MaS

2 Description of Subject

The Pneumatics and Hydraulics course is focusing on pneumatics-, electro-pneumatics, hydraulic and electro-hydraulic system as a part of an actuator in a mechatronic system. The course will emphasize basic theory, components sizing, construction and function, how to read pneumatics and fluid power circuit diagrams using the correct symbols and troubleshooting techniques. The controls of hydraulic system is controlled by electrical (electro-hydraulics) are introduced. During the semester the students will have the opportunity to get practical workshop in PT. FESTO Indonesia located in Technopark-BSD City to exercise pneumatics and electro-pneumatics-systems.

3 Objectives

- to integrate the mechatronics knowledge into designing and building of a mechatronic system

4 Competency

After having the course, students are expected have to:

- Apply product design techniques to the development of mechatronic systems;
- Design and build a simple mechatronic product using the correct method and tools;
- Manage a mechatronic-engineering project, from a scratch into the product;
- write the documentation of the project;
- Demonstrate the presentation skills in front of the class to explain the project-product
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5 Learning Approach / Methodology

- Lectures/ Class contact (time-tabled) supplemented with interactive questions and answers;
- Discussion, design a simple mechatronics product, sample problem, group work;
- Student Study Effort: writing project proposal, project work design and building, writing project report, presentation,

6 Evaluation

5.1	Absence maximum	25%
5.2	Participation in Discussion	05 Points
5.3	Homework / Classwork	05 Points
5.4	Presentation /Simulation	10 Poin
5.5	Daily Quiz	20 Points
5.6	Final Examination	60 Points
	Total	100 Points

7 Text Book and Reference

1	<p>Main Text Book:</p> <ul style="list-style-type: none"> • “Pneumatic Basic Level” , Authors: Peter Croseer & Frank Ebel, Publisher: FESTO–AG Germany. • “Electro pneumatic Basic Level”, Author: G Prede & D. Schloz, Publisher: FESTO–AG Germany.
2	<p>Supplementary Text books:</p> <ul style="list-style-type: none"> • “99 Example of pneumatic application”, Author: G Prede & D. Schloz Publisher: FESTO–AG Germany.

8 Content / Topics of Lecture

Week	Content/ Topics of Lecturing	Text Book	Remark
1-2	Fundamental of pneumatic : <ul style="list-style-type: none"> • History of Pneumatic • Physical law of pneumatic • Gas law and various process • Development of pneumatic • Characteristic and application of pneumatic • Structure and signal flow of pneumatic system , symbol and standard of component 	Ch1	
2-3	Air Generation and distribution: <ul style="list-style-type: none"> • Air quality: Humidity , cleans , pressure , standard air temperature • System for air generation: Compressor , Dryer , Filter , Lubricator • Distribution system: Piping system • SAC, DAC, RC, motor and pneumatic indicator , construction and characteristic of cylinder 	Ch2	
3-4	Pneumatic components: <ul style="list-style-type: none"> • Actuator and output Device • Valve and control Valve: Directional control valve, pressure control valve, solenoid valve. • Sensor: Type and characteristic of sensor , application in electro pneumatic 	Ch3	Quiz-1
4-5	Design Procedure of Pneumatic: <ul style="list-style-type: none"> • Method of development • Control in Pneumatic Systems: Single acting, Double acting and multi cylinder actuation, Pneumatic and electro pneumatic simple circuit, Control system in pneumatic, Position control, Speed control, time delay 	Ch4	
6-7	Example and application of pneumatic and Electro pneumatic System: <ul style="list-style-type: none"> • One Cylinder Control • Parallel motion Control • Two actuator control • Reversing Valve control • Logic control system. • Allocating device, sorting device , edge folding device, Foil welding drum, switching point device • Feed rail separator, Welding machine for thermoplastic, Quarry stone sorter • Compactor for domestic rubbish, clamping camera housing • Input station for laser cutter, partial automation of an internal grinder, Drilling machine • Pneumatic counter 	Ch5	Quiz-2
8	MIDTERM SEMESTER BREAK		

9-10	<p>Fundamental of Hydraulic:</p> <ul style="list-style-type: none"> • History of Power Fluid: Characteristic and application of hydraulic , stationary and mobile hydraulic • Physical law of Hydraulic: Pascal’s Law and Fluid flow equation, laminar flow turbulent flow, pressure losses, cavitation, throttle point • Hydraulic symbol: Symbol of various hydraulic component 		
11	<p>Hydraulic Fluid:</p> <ul style="list-style-type: none"> • Characteristic of hydraulic fluid • Viscosity, temperature , density characteristic 		Quiz-3
12-13	<p>Hydraulic Component:</p> <ul style="list-style-type: none"> • Power Supply section: Characteristic of hydraulic pump , Characteristic of filter , coupling reservoir , cooler and heater • Distribution system: Piping system characteristic • Actuator and output Device: SAC, DAC, motor construction and characteristic of cylinder • Valve and control Valve: Directional control valve, pressure control valve, solenoid valve • Actuator and output Device: SAC, DAC, motor construction and characteristic of cylinder • Valve and control Valve: Directional control valve, pressure control valve, solenoid valve 		Quiz-4
14	<p>Design Procedure of Hydraulic</p> <ul style="list-style-type: none"> • Method of development • Control in Hydraulic , No Load Circuits, speed and position control, synchronous and locking circuit, Free fall preventing circuits, Load responsive circuit , closing circuit • Characteristic of Hydraulic • Single-acting cylinder • Double-acting cylinder • Valve control • Accumulator • Software using in Hydraulic design 		Quiz 5
15	<p>Example and application of Hydraulic and Electro Hydraulic System:</p> <ul style="list-style-type: none"> • Automatic lathe, Package lifting device, Drawing press • Cylinder feeding device, Hardening furnace • Furnace door control • Conveyor tensioning device, Painting booth, Rotary machining station • Cold-store door. 		
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