

Course Unit	Fluid Power		Field of study	Fluid Mechanics and Hydraulics	
Bachelor in	Mechanical Engineering		School	School of Technology and Management	
Academic Year	2022/2023	Year of study	3	Level	1-3
Type	Semestral	Semester	2	ECTS credits	6.0
Workload (hours)		162	Contact hours	T - TP 60 PL - TC - S - E - OT - O -	
Code 9123-759-3204-00-22					

T - Lectures; TP - Lectures and problem-solving; PL - Problem-solving, project or laboratory; TC - Fieldwork; S - Seminar; E - Placement; OT - Tutorial; O - Other

Name(s) of lecturer(s) Sérgio Manuel de Sousa Rosa

Learning outcomes and competences

At the end of the course unit the learner is expected to be able to:

1. Express a physical quantity as a suitable unit. Know the units.
2. Acquire knowledge about transmission, command and control techniques through pneumatic and hydraulic oils, namely in the components dimensioning.
3. Describe the different components used in pneumatic and hydraulic oils, as well as their function, functioning and specific aspects related to security.
4. Solve and analyse pneumatic and hydraulic circuits in Mechanical Engineering.
5. Develop the ability to lead laboratory experiences.

Prerequisites

Before the course unit the learner is expected to be able to:

1. Distinguish physical and chemical properties in fluids;
2. Recognize the constituent parts of a mechanism.

Course contents

Understand hydraulics oils and air as a fluid, their behaviour, physical properties and principles. Present circuit components, function and functioning principles. work automation processes to simplify their control and minimize problems.

Course contents (extended version)

1. Introduction to Hydrostatic Transmissions
 - Advantages and disadvantages
 - energy sources
 - Classification of hydraulic circuits
2. Basic Principles of Hydrostatic Transmissions
 - pressure
 - Pascal's principle
 - Energy conservation
 - Units in hydraulic systems
3. Hydraulic / Pneumatic Oils
 - Types of hydraulic oils and their classification
 - Compressed air
 - Physical and chemical properties
4. Circuits
 - Examples of hydraulic circuits
 - Installation care of pneumatic circuits
 - Symbols
5. Compressors, Hydraulic Pumps and Motors
 - symbols
 - type-circuits
 - Characteristic curves
 - Applications
6. Hydraulic Actuators
 - Linear actuators (simple, double and triple effect)
 - Actuators standardisation and selection
 - Applications
7. Valves and applications
8. Hydraulic Accumulators
 - Types of accumulators
 - Accumulator dimensioning
 - Applications
9. Hydraulic / Pneumatic Tanks
 - Function
 - Dimensioning
 - Components
 - Pressure tanks
10. Hydraulic / Pneumatic Filters
 - Filter function and distinction
 - Selection
 - Constitution
11. Electro-Hydraulic / Pneumatic
 - Logic and Karnaugh maps
 - Structure of a control circuit
 - Sequence diagrams
 - Practical examples of electro-hydraulic circuits
 - Software usage for understanding circuits and faultfinding
 - From Grafcet to Ladder diagram
12. Security systems
13. Systems analysis and simplification

Recommended reading

1. Rohner, Peter, "Industrial Hydraulic control"
2. "Hydraulics: Theory and Applications" - Bosch, 1998

Teaching and learning methods

Lessons will be regularly interrupted by teacher's questions, suggestions and presentation of students and teacher experiences. Even daily experience will be used to acquire some basic concepts. Individual development of pneumatic or hydraulic circuits. Exercise solving. Resort to computers, experiences and bibliography.

Assessment methods

1. Alternative 1 - (Regular, Student Worker) (Final, Supplementary, Special)
 - Development Topics - 30%
 - Practical Work - 30%
 - Final Written Exam - 40%
2. Alternative 2 - (Student Worker) (Final, Supplementary, Special)
 - Development Topics - 30%
 - Final Written Exam - 70%
3. Alternative 3 - (Regular, Student Worker) (Supplementary, Special)
 - Final Written Exam - 100%

Language of instruction

1. Portuguese
2. English

Electronic validation

Sérgio Manuel de Sousa Rosa	Luís Manuel Ribeiro Mesquita	João da Rocha e Silva	José Carlos Rufino Amaro
16-03-2023	19-03-2023	20-03-2023	25-03-2023