

Course Unit	Fluid Power	Field of study	Fluid Mechanics and Hydraulics
Bachelor in	Mechanical Engineering	School	School of Technology and Management
Academic Year	2023/2024	Year of study	3
Type	Semestral	Semester	2
Workload (hours)	162	Contact hours	T - TP 60 PL - TC - S - E - OT - O -
Level	1-3	ECTS credits	6.0
Code	9123-759-3204-00-23		

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)
 - Intermediate Written Test - 50% (1st written midterm test)
 - Intermediate Written Test - 50% (2nd written midterm test)
2. Exam - (Regular, Student Worker) (Supplementary)
 - Final Written Exam - 100% (Written Exam)
3. Special Exam - (Regular, Student Worker) (Special)
 - Final Written Exam - 100% (Written Exam)

Language of instruction

1. Portuguese
2. English

Electronic validation

Sérgio Manuel de Sousa Rosa	Debora Rodrigues de Sousa Macanjo Ferreira	João da Rocha e Silva	José Carlos Rufino Amaro
04-03-2024	04-03-2024	09-03-2024	16-03-2024