

MEC 162

Applied Hydraulics and Pneumatics

COURSE OUTLINE

Prerequisites: Basic knowledge of algebra or divisional approval

Course Description:

This course covers the basics of pneumatic, electropneumatic and hydraulic control circuits in a complex mechatronic system. Students will learn the functions and properties of control elements based upon physical principles, and the roles they play within the system. Technical documentation such as data sheets, circuit diagrams, displacement step diagrams and function charts will also be covered. By understanding and performing measurements on the pneumatic and hydraulic control circuits, students will learn and apply troubleshooting strategies to identify, localize and (where possible) correct malfunctions. Preventive maintenance of (electro) pneumatic and hydraulic components as well as safety issues within the system will be discussed.

Semester Credits: 3 hrs **Lecture Hours:** 2 Hours **Lab/Recitation Hours:** 2 Hours

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Course Outcomes:

At the completion of this course, the student should be able to:

- Understand what a mechatronic system is, and the inter-relationships of components and modules within a complex mechatronic system with a focus on (electro) pneumatic and hydraulic control systems.
- Understand the role of (electro) pneumatic and hydraulic control systems in complex mechatronic system and subsystems.
- Understand troubleshooting, maintenance and safety issues revolving around (electro) pneumatic and hydraulic circuits within a mechatronic system.

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Required Materials:

1. Tooling University, online subscription, purchased through Tooling U bookstore(online) to receive student discount.
2. Textbook provided by Instructor for in class use: W. Haring, M. Metzger, R.-C. Weber. Pneumatics Basic Level Workbook with CD. Edition: 04/2005. Publisher: Festo Didactic GmbH & Co. KG. ISBN: Order No. 541088.

Textbook (optional)*:

The following supplementary materials are available: [Simulation software for PLC programming.](#)

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Applied Hydraulics and Pneumatics

Topical Description:

Content to be covered within this course includes the following topics:

- Pneumatics and Electropneumatics
 - Introduction
 - Electropneumatic Control System
 - Signal Processing Structure
 - Function Diagram and Pneumatic Circuit Diagram
 - Actuation of Pneumatic Cylinders
 - Sequence Control Systems
 - Electrically Actuated Directional Control Valves (DCVs)
 - Displacement-Step Diagram
 - Pneumatic Actuators
 - Stroke Speed Regulation of Pneumatic Actuators
 - Basic Electropneumatic Control Circuits
 - Air Generation and Distribution
 - Terminal Connections
 - Electrical Control Devices
 - Safety Regulations
- Hydraulics
 - Overview
 - Circuit Symbols
 - Design of Circuit Symbols
 - Physical Principle
 - Transmissions
 - Pressure Transfer and Flow Rate
 - Solenoid Activated Directional Control Valves

NOTE: The order in which the content will be discussed is dependent upon the mechatronic system which is being used. In each case, the component and/or class of components will be discussed within the context of the system and the module in which the component is located. This means that the exact order of presentation will vary according to the system available for instruction. It is also important that all classes of electrical components be discussed, whether available in the training system or not. Focus in all cases is on the role of the components within a module and system, identification of problems, routine maintenance, troubleshooting, and safety issues with the goal of preventing system downtime or reducing them to a minimum.

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Course Materials

Recommended basic course materials are in digital form:

Course materials provided by SMSCP Partner Schools to their students are at the partner school's discretion, and may include special software such as SIMIT, Diagnostic Kit software, etc. If desired, a supporting textbook on basic PLC topics may be required by the school or instructor. Students must also have access to a mechatronic training system containing all or most of the basic component types covered in the course. Please see the SMSCP "Hardware Requirements" document for more information on system requirements for Level 1 instruction.

Introduction to Mechatronics

Notes to Instructors

1. Fluid CIM, a software package for simulation, is required

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