

I. COURSE DESCRIPTION

- A. Department Information:
Division: Technical
Department: Machine Trades
Course ID: MACH 093A
Course Title: Fluid Power Systems II
Units: 2
Lecture: 1 Hours
Laboratory: 3 Hours
Prerequisite: MACH 092A
- B. Catalog and Schedule Description:
This course focuses on advanced hydraulic, advanced pneumatic, and electro-fluid power systems. Fundamentals of fluid power controls including hydraulic and pneumatic directional control valves, electrical control of fluid power, cylinder application, air logic controls, electronic sensors, and vacuum systems.

II. NUMBER OF TIMES COURSE MAY BE TAKEN FOR CREDIT: One

III. EXPECTED OUTCOMES FOR STUDENTS:

Upon completion of this course, students will be able to:

- A. Distinguish and use a Directional Control Valve (DCV) using various spool options.
- B. Explain how relay circuits are used in fluid power control circuits.
- C. Demonstrate how flow control valves and series actuators are used in synchronization circuits on an Amatrol actuator workstation?
- D. Evaluate the usage of pilot-operated relief valve in several flow applications.
- E. Give examples of pneumatic DCVs and their application.
- F. Sketch air logic circuits to control actuators.
- G. Operate various electronic sensors used in fluid-power control circuits.
- H. Set-up and assess various vacuum components used in fluid power circuits.

IV. COURSE CONTENT:

- A. Hydraulic DCV Applications
 1. DCV spool options
 2. CAM-operated hydraulic valves
 3. 4/2 DCV applications
- B. Electro-Fluid Power Systems
 1. Solenoid-operated DCV applications
 2. Connect, monitor, and adjust pressure settings of a pressure switch
 3. Design relay circuit that uses a pressure switch for a safety interlock
- C. Hydraulic Cylinder Applications
 1. Connect and operate a basic regeneration circuit
 2. Calculate the extend speed and force of a cylinder in regeneration
 3. Set-up and adjust a cylinder synchronization circuit using flow control valves
- D. Hydraulic Relief Valve Operation
 1. Use a pilot-operated relief valve to unload a pump by venting
 2. Connect/Operate a remotely controlled pilot-operated relief valve circuit
 3. Design a circuit to provide a flow-pressure control with unloading
- E. Pneumatic DCV Applications
 1. Connect and operate a pneumatic cam-operated 4/2 DCV and 3/2 DCV
 2. Design a pneumatic circuit to sequence two cylinders
 3. Connect and operate a cylinder deceleration circuit using power braking
- F. Air Logic
 1. Use simulation software to design a pneumatic seal-in circuit
 2. Use simulation software to design a pneumatic circuit to control a cylinder
 3. Connect and operate an air logic circuit to control a cylinder

- G. Electronic Sensors
 - 1. Connect and operate an inductive and capacitive sensor
 - 2. Measure and analyze inductive and capacitive sensor performance
 - 3. Measure and analyze Hall-effect sensor performance
- H. Vacuum Systems
 - 1. Convert between units of Mercury and units of air pressure
 - 2. Connect and read a vacuum gauge, manometer, vacuum generator and cup
 - 3. Calculate vacuum cup lift force

V. METHODS OF INSTRUCTION:

This course is designed for a combination of hands-on and lectures components, where hydraulic and pneumatic assemblies can be tested and operated. The instructional methods to be used include:

- A. Multimedia Curriculum, Student Experimentation
- B. Hands-on Skill Exercises-Authentic Assessment
- C. Formula Calculations
- D. Student Portfolio demonstrating lab competencies

VI. TYPICAL ASSIGNMENTS:

- A. Discussion
 - Discuss hydraulic and pneumatic directional control valves. Examine their applications, safety measures, and operation.
- B. Reading
 - 1. Read the Learning Activity Packets on Amatrol Vacuum Systems and answer the following questions:
 - a) How are vacuum gauges and manometers used in conjunction with each other?
 - b) What are the differences between units of Mercury and air pressure?
 - 2. Demonstrate the use of an electronic sensor within a fluid power control circuit.
- C. Hands-on Skill Demonstration
 - 1. Each student will connect and operate a hydraulic circuit using electrical control components.
 - 2. Each student will demonstrate the proper usage of series actuators in the set up ration of a synchronization circuit.

VII. EVALUATION(S):

- A. Methods of Evaluation
 - 1. Objective and subjective examinations (for lecture and text assignments)
Typical Questions:
 - a) Describe the differences between the four types of DCV spool options used in hydraulics.
 - b) What are the methods used to synchronize cylinders?
 - 2. Subjective evaluation of student developing a portfolio that will be evaluated by the instructor for a final grade on the content.
 - 3. Instructor evaluation of the students' successful completion of hydraulic and pneumatic component testing.
- B. Frequency of Evaluation
 - 1. Nine computerized Learning Activity Packets
 - 2. Nine hands-on application tests
 - 3. One portfolio

VIII. TYPICAL TEXT(S):

Integrated Systems Technology, Learning Activity Packets 1-10, Amatrol Corporation, Jeffersonville, Indiana, 2000
Edward Hoffman, Student Shop Reference Handbook, 2nd Edition, Industrial Press, New York, 2000

San Bernardino Valley College
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Weingartner, Machinist Ready Reference, 10th Edition, Prakken Publication, Ann Harbor, Michigan, 2000

IX. OTHER SUPPLIES REQUIRED OF STUDENTS:
Calculator