

I. COURSE DESCRIPTION:

A. Department Information:

Division: Technical
Department: Machine Trades
Course ID: MACH 092A
Course Title: Fluid Power Systems I
Units: 2
Lecture: 1 Hours
Laboratory: 3 Hours
Prerequisite: None

B. Catalog and Schedule Description:

This course focuses on basic hydraulic and pneumatic systems. The student will study hydraulics, pneumatic power, basic circuits, symbols, schematic diagrams, and principles of power and flow processes.

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. Identify the main operations of a hydraulic power unit.
- B. Explain the five components of a hydraulic system.
- C. Interpret the fundamentals of a hydraulic schematic and its relations to fluid flow.
- D. Critically evaluate how flow rate is calculated utilizing a flow rate meter.
- E. Analyze the components of various needle valve systems.
- F. Calculate force output of a hydraulic cylinder unit.
- G. Illustrate the functions of five various flow valves related to hydraulic systems.
- H. Identify and evaluate the major components of a pneumatic air system.

IV. COURSE CONTENT:

- A. Safety in Hydraulic and Pneumatic Systems
 1. Valve safety
 2. Safety pressures
 3. Safety in operating hydraulic and pneumatic valves
 4. Supply line safety maintenance
- B. Operation of Various Hydraulic Power Units
 1. Reading liquid levels to correct settings
 2. Procedures for adjusting pressure settings
 3. Identification of the basic components of hydraulic units
- C. Hydraulic and Pneumatic Schematics
 1. Hydraulic symbols related to assembly diagrams
 2. Forms of symbols and relationship to system
 3. Eight basic rules for drawing a hydraulic assembly
- D. Flow Rate and Meters
 1. Flow rate calculations
 2. Types of flow meters
 3. Connecting and reading a flow meter
 4. Calibrating flow rates
- E. Needle Valve Assemblies and Their Usage
 1. Function of needle valves
 2. Operation of a needle valve
 3. Actuator speed controls
- F. Pressure Verses Cylinder Force
 1. Pascal Law
 2. Cylinder forces
 3. Fluid Resistance

- G. Fluid Control Valves
 - 1. Function of a relief valve
 - 2. How to set-up a relief valve circuit
 - 3. Types of valves
 - a) Check Valves
 - b) Relief valves
 - c) Flow control valves
- H. Pneumatic Power Systems
 - 1. Safety rules for pneumatics
 - 2. Five basic pneumatic concepts
 - 3. Pneumatic pressures
 - 4. Single and double acting cylinders

V. METHODS OF INSTRUCTION:

This course is designed for a combination of hands-on and lectures components, where hydraulic 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. Lecture
 - Discuss hydraulic power systems, safety, pressure and flow formulas, and pneumatic system construction.
- B. Reading
 - 1. Read Learning Activity Packets on Hydraulic Power Systems and answer the following questions:
 - a) What are the main operations of a hydraulic power unit?
 - b) Explain the five components of a hydraulic system.
 - 2. Read Amatrols Pressure Control Circuits Systems and answer the following questions:
 - a) What are the procedures for setting pressure control valves?
 - b) Describe the proper safety procedures for setting control valves.
- C. Hands-on Skill Demonstration
 - 1. Each student will demonstrate three safety factors dealing with hydraulic components.
 - 2. Each student will demonstrate five basic pneumatic circuits and the process for trouble shooting.

VII. EVALUATION(S):

- A. Methods of Evaluation
 - 1. Objective and subjective examinations (for lecture and text assignments)
 - Typical Questions:
 - a) Describe differences between three types of check valves used in hydraulics.
 - b) Calculate force output of a hydraulic cylinder unit.
 - 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 student's successful completion of hydraulic component testing.
- B. Frequency of Evaluation
 - 1. Ten computerized learning activity packets
 - 2. Ten hands-on application tests
 - 3. One portfolio

San Bernardino Valley College
Curriculum Approved: January 27, 2003
Last Updated: December 2002

VIII. TYPICAL TEXT(S):

Integrated Systems Technology, Learning Activity Packets 1-10, Amatrols Corporation,
Jeffersonville, Indiana, 2000

Edward Hoffman, Student Shop Reference Handbook, 2nd Edition, Industrial Press, New
York, 2000

Weingartner, Machinist Ready Reference, 10th Edition, Prakken Publication, Ann Harbor,
Michigan, 2000

IX. OTHER SUPPLIES REQUIRED OF STUDENTS:

Calculator