



# BAKER COLLEGE

## STUDENT LEARNING OUTCOMES

ME 2710 Hydraulics Pneumatics  
3 Semester Hours

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### Student Learning Outcomes and Enabling Objectives

1. Examine the safety aspects of Hydraulic and Pneumatic uses in manufacturing. (Chapter 5)
  - a. Explore workplace and environmental considerations.
  - b. Explore industrial hazard control.
  - c. Explore fluid power safety factors.
  - d. Examine safety requirements and programs.
2. Demonstrate an understanding of hydraulic systems and their basic principles. (chapters 1-3)
  - a. Explore the history of fluid power.
  - b. Explain the advantages and disadvantages of fluid power systems.
  - c. Compare the functions and structure of hydraulic systems.
  - d. Examine the components and operation of basic hydraulic systems.
  - e. Identify basic principles of mechanics and mechanical measurement.
  - f. Explain fluid power transmission and heat transfer
3. Identify hydraulic circuits and symbols. (chapter 4)
  - a. Interpret hydraulic circuit diagrams.
  - b. Explore the various hydraulic symbols.
4. Examine the functions and characteristics of hydraulic fluid applications. (chapter 6, 8 and 12)
  - a. Explore performance characteristics of hydraulic fluid applications.
  - b. Explore commonly used fluids.
  - c. Identify hydraulic fluid additives.
  - d. Explain hydraulic fluid specifications and maintenance.
  - e. Explain conductor installation (pipe, tubing, hose).
  - f. Identify sources and effects of contamination.
  - g. Explore system operating temperatures.
  - h. Explain filters maintenance.
5. Demonstrate a working knowledge of hydraulic power units and pumps. (chapter 7)
  - a. Explain reservoirs and pressure control valves.
  - b. Identify basic pump structure, operation and classifications.
  - c. Explore various pump designs.
  - d. Explore pump features and operating considerations.

6. Identify hydraulic system actuators. (chapter 9)
  - a. Identify basic cylinders and their classification.
  - b. Identify cylinder cushioning and mounting.
  - c. Explore rotating hydraulic actuators.
  - d. Explain the use of hydraulic motors.
  - e. Explain the purpose of hydrostatic drives.
  
7. Demonstrate competency when controlling pressure, direction and flow of a hydraulic system. (chapter 10)
  - a. Explain basic structure and features of control valves.
  - b. Explain valve operation and associated springs, pressure and flow.
  - c. Use pressure control devices.
  - d. Use directional control devices.
  - e. Use flow control devices.
  
8. Examine the function and hazards of hydraulic accumulators. (chapter 11)
  - a. Explore basic function, design and operation of accumulators.
  - b. Explore energy storage and supplementation.
  - c. Explain how to size and select the proper accumulator.
  - d. Explain accumulator maintenance.
  
9. Demonstrate the various applications of hydraulic circuits. (chapter 13)
  - a. Use pressure relations within a hydraulic circuit.
  - b. Use basic flow methods of hydraulic circuits.
  - c. Use motion and sequencing of actuators in hydraulic circuits.
  - d. Use system safety and decompression in hydraulic circuits.
  
10. Compare the functions of compressed air and pneumatic energy transmission. (chapter 14)
  - a. Explore pneumatic system compression and expansion of air.
  - b. Explain pressure and volume variations.
  - c. Explain temperature variations.
  
11. Demonstrate knowledge of compressed air sources and contamination prevention. (chapter 15 and 16)
  - a. Explore compressor design and operation.
  - b. Explore compressor classifications.
  - c. Explain compressor parts and functions.
  - d. Explain controlling dirt, temperature and moisture.
  - e. Explain maintaining air filtration, lubrication and regulation.
  
12. Show comprehension of the basic functions of pneumatic actuators and control devices. (chapter 17 and 18)
  - a. Explore pneumatic cylinders.
  - b. Explore rotary motors.
  - c. Explore reciprocating motors.
  - d. Explore pressure control methods and devices.
  - e. Explore directional control methods and devices.
  - f. Explore flow control methods and devices.
  
13. Demonstrate the ability to use pneumatic circuits and systems. (chapter 19)
  - a. Control maximum circuit pressure.
  - b. Provide multiple pressures to the system.
  - c. Control airflow to allow for various types of cylinders and valves.
  - d. Explain single cycle and continuous cycle operations.
  - e. Use booster and time delay circuits.

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## Big Ideas and Essential Questions

### Big Ideas

- Industrial Safety Foundations of Hydraulics and Pneumatics
- The Role of Hydraulics and Pneumatics
- Production Efficiencies of Hydraulics and Pneumatics
- Hydraulic and Pneumatic processes
- Components

### Essential Questions

- Why is safety the first priority?
  - How can industrial hydraulic and pneumatic processes be controlled to attain product conformance?
  - How do I determine if a process is unsafe?
  - Why is it important to consider process efficiencies?
  - How do I determine what materials to utilize in hydraulic and pneumatic processes?
  - What impact does an incorrect usage have on a product or process?
  - How the different components of hydraulics and pneumatics used?
  - How does documentation impact industrial communication between shifts?
  - What are the potential uses in the future?
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These SLOs are not approved for experiential credit

Effective: Fall 2017