



# **Alabama Department of Postsecondary Education**

## **Representing the Alabama Community College System**

### **STATEWIDE CAREER/TECHNICAL EDUCATION COURSE ARTICULATION REVIEW MINUTES**

Articulation Agreement Identifier: IET 131 (2011-1) Identifier is the postsecondary course prefix followed by Plan-of-Instruction version number (e.g.; INT 100 (2005-1)).

Applicable CIP code(s): 15.0612

Postsecondary course prefix, number, and title: IET 131 – Fluid Power Systems

Secondary Course(s) of Study: 480301/540011 - Industrial Systems and Maintenance I + 480302/540012 - Industrial Systems and Maintenance II + 480303/540013 - Industrial Systems and Maintenance III + 480302/540014 - Industrial Systems and Maintenance IV

Initial Review: November 17, 2009

DPE Annual Review: February 16, 2012

Effective dates: Fall Semester 2011.

Course Content Analysis (all postsecondary course objectives must be sufficiently addressed in the secondary courses):

#### **Notes:**

- 1 Skills and knowledge contained in the postsecondary course objectives must be present in the corresponding secondary objectives for a “match” to occur.**
- 2. Postsecondary and Secondary objectives must reflect similar content and performance levels before the course articulation agreement will be recommended to the TEDAC Oversight Committee.**
- 3. More than one Secondary course may be used in order to articulate to a Postsecondary course.**

| Postsecondary Course Objectives  | Secondary Course(s) and Location(s)   | TEDAC Comments |
|--|---|----------------|
| <p><b>Module A Hydraulic Systems</b></p> <p><b>Competencies:</b><br/>                     A1.0 Perform routine maintenance, troubleshooting and repair on hydraulic systems.</p> <p><b>Performance Objectives:</b><br/>                     A1.1 Safely inspect, maintain, troubleshoot, and remove and replace defective components of a specified hydraulic system.</p> <p><b>Learning Objectives:</b><br/>                     A1.1.1 Identify common safety rules as they apply to the hydraulics/pneumatics systems, including removing and blocking all stored energy.<br/>                     A1.1.2 Define common terms such as force, energy, inefficiency, pound, work, inertia, resistance, horsepower, power, energy, pressure, friction, hydraulics.<br/>                     A1.1.3 Describe the purpose of a typical hydraulic system.<br/>                     A1.1.4 Identify the components of a typical hydraulic system.<br/>                     A1.1.5 Solve hydraulic system problems using mathematical formulas.<br/>                     A1.1.6 State the characteristics of a liquid.<br/>                     A1.1.7 State the characteristics of a gas.<br/>                     A1.1.8 Solve hydraulics/pneumatics problems using Pascal's law.<br/>                     A1.1.9 Explain the operation of force intensifiers.<br/>                     A1.1.10 Explain factors that affect transmission of force and energy.<br/>                     A1.1.11 Explain how to read and interpret vacuum gages and pressure gages.<br/>                     A1.1.12 Explain cavitation and pseudo-cavitation.<br/>                     A1.1.13 State what causes cavitation and pseudo-cavitation to occur.<br/>                     A1.1.14 Explain how altitude affects hydraulic systems.<br/>                     A1.1.15 List the two basic types of hydraulic actuators.</p> | <p><b>Industrial Systems and Maintenance II, Unit 13-16, Hydraulics</b></p> <p><b>Content Standards</b></p> <p>13. Demonstrate safety procedures as prescribed by approved industry standards.<br/>                     14. Explain the principles of hydraulic theory relative to industrial maintenance.<br/>                     • Defining units of pressure<br/>                     • Defining properties of hydraulic fluids<br/>                     15. Explain pressure and flow relative to the operation of hydraulic systems.<br/>                     • Identifying types of pumps, motors, valves and cylinders<br/>                     • Defining properties of hydraulic fluids<br/>                     16. Explain common maintenance tasks used to prevent hydraulic system failures.</p> <p><b>Learning Objectives</b></p> <p>1. Explain safe handling of hydraulic fluids, cylinders, control valves and hoses.<br/>                     2. Demonstrate hydraulic practices that apply to industry.<br/>                     3. Identify the location of MSDS on hydraulic fluids used in the shop.<br/>                     4. Explain pressure flow relative to the operation of hydraulic systems.<br/>                     5. List the types of pumps, motors, valves and cylinders found in industry.<br/>                     6. Explain preventative maintenance techniques for hydraulic systems.<br/>                     7. Demonstrate troubleshooting practices for hydraulic systems.<br/>                     8. Explain fluid filtration.</p> |                |

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| <p>A1.1.16 Explain the operation of hydraulic cylinders.<br/>                     A1.1.17 Explain the relationship between pressure, force and area when working with cylinders.<br/>                     A1.1.18 Calculate cylinder area, rod speed, cylinder volume, force, and pressure in hydraulic cylinders.<br/>                     A1.1.19 Calculate torque in hydraulic actuators.<br/>                     A1.1.20 Calculate horsepower and speed of hydraulic motors.<br/>                     A1.1.21 State which pressure control valves should be externally drained.<br/>                     A1.1.22 Describe the primary functions of normally non-passing pressure control valves.<br/>                     A1.1.23 Explain the purpose of bypass valves in suction filters and pressure filters.<br/>                     A1.1.24 Explain the operation and application of a pilot operated pressure control valve.<br/>                     A1.1.25 Explain the operation of various circuits utilizing a pressure control valve.<br/>                     A1.1.26 Explain the operation of hydraulic pumps including vane type, gear type, and piston type.<br/>                     A1.1.27 Identify characteristics of closed loop and open loop hydrostatic systems.<br/>                     A1.1.28 Explain the function of the reservoir.<br/>                     A1.1.29 Explain the operation of directional control valves.<br/>                     A1.1.30 Identify symbols used in diagrams of hydraulic systems.<br/>                     A1.1.31 Explain the functions of check valves in hydraulic systems.<br/>                     A1.1.32 Interpret schematic diagrams of hydraulic systems.</p> <p><b>Competencies:</b><br/>                     A2.0 Comprehend the environmental aspects of fluid contamination.</p> <p><b>Performance Objectives:</b><br/>                     A2.1 Properly store and dispose hydraulic fluids and contaminated materials.</p> <p><b>Learning Objectives:</b></p> | <p><b>Industrial Systems and Maintenance IV, Unit 11-12, Troubleshooting and Repairing Hydraulic Equipment Content Standards</b></p> <p>11. Inspect hydraulic system equipment for system function.<br/>                     12. Explain basic hydraulic principles to be considered before troubleshooting hydraulic-driven equipment.</p> <p><b>Learning Objectives</b></p> <p>1. Demonstrate troubleshooting skills for hydraulic systems.<br/>                     2. Explain the functions of a hydraulic system.<br/>                     3. Demonstrate hydraulic principles for troubleshooting driven equipment.<br/>                     4. Explain possible problems to be solved through troubleshooting skills.</p> <p><b>Industrial Systems and Maintenance I, Unit 22-26, Pneumatics Content Standards</b></p> <p>22. Explain compressed air theory relative to industrial maintenance.<br/>                     • Defining units of pressure and volume<br/>                     • Defining the properties of gases, including isothermic, isobaric, isochoric, and standard volume<br/>                     23. Explain pressure and flow including Bernoulli’s principle.<br/>                     24. Identify types of air compressors and compressor accessories.</p> <p>Examples: reciprocating, rotary, air receivers, inlet filter</p> |                |

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| <p>A2.1.1 Identify procedures for containing and cleaning up hydraulic fluid spills.</p> <p>A2.1.2 Explain how to read and interpret an MSDS.</p> <p>A2.1.3 Explain the appropriate methods for storage and disposal of hydraulic fluids and contaminated materials.</p> <p>A2.1.4 Explain the characteristics of both flammable and fire resistant fluids.</p><br><p><b>Module A Pneumatic Systems</b></p> <p><b>Competencies:</b></p> <p>B1.0 Perform routine maintenance, troubleshooting and repair on pneumatic systems.</p> <p><b>Performance Objectives:</b></p> <p>B1.1 Safely inspect, maintain, troubleshoot, and remove and replace defective components of a specified pneumatic system.</p> <p><b>Learning Objectives:</b></p> <p>B1.1.1 Define Pneumatics.</p> <p>B1.1.2 Describe the purpose of a typical pneumatic system.</p> <p>B1.1.3 Identify the components of a typical pneumatic system.</p> <p>B1.1.4 Describe the function of each component.</p> <p>B1.1.5 Identify symbols used in diagrams of pneumatic systems.</p> <p>B1.1.6 Interpret schematic diagrams of pneumatic systems.</p> <p>B1.1.7 Summarize the pneumatic system preventive maintenance procedures.</p> <p>B1.1.8 Discuss the various methods of air preparation (ie</p> | <p>25. Explain air humidity and air dehydration, including after-coolers and air dryers.</p> <p>26. Describe the operation and function of various actuators.</p><br><p><b>Learning Objectives</b></p> <ol style="list-style-type: none"> <li>1. Identify properties of gases.</li> <li>2. Explain compressed air theory relative to industrial maintenance.</li> <li>3. Identify units related to pressure and volume.</li> <li>4. Explain Bernoulli's Principle.</li> <li>5. Describe types of compressors and accessories.</li> <li>6. Explain air humidity and air dehydration, including after-coolers and air dryers.</li> <li>7. Identify different types of actuators and their applications.</li> </ol><br><p><b>Industrial Systems and Maintenance III, Unit 3-8, Basic Pneumatic Systems Content Standards</b></p> <ol style="list-style-type: none"> <li>3. Explain pneumatic safety and physical characteristics of gases.</li> <li>4. Explain the pneumatic transmission of energy related to basic pneumatic systems.</li> <li>5. Explain principles of compressor operation and compressed gases.</li> <li>6. Explain various types of compressors used in pneumatic systems.</li> <li>7. Explain compressed-air treatment used in pneumatic systems.</li> <li>8. Explain pneumatic system components and symbols used in pneumatic systems.</li> </ol><br><p><b>Learning Objectives</b></p> |                |

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| <p>purpose, receiver sizing, and specialized requirements for sterile processes).</p> <p>B1.1.9 Summarize the lubrication of pneumatic systems and pneumatic tools.</p> <p>B1.1.10 Explain the operation of a typical pneumatic system.</p> <p>B1.1.11 Summarize the process of troubleshooting a pneumatic system.</p> | <ol style="list-style-type: none"> <li>1. Demonstrate pneumatic safety procedures.</li> <li>2. Describe the physical characteristics of gases.</li> <li>3. Explain the pneumatic transmission of energy related to basic pneumatic systems.</li> <li>4. List the principles of compressor operation and compressed gasses.</li> <li>5. Identify various types of compressors used in pneumatic systems.</li> <li>6. Describe compressed-air treatment used in pneumatic systems.</li> <li>7. Identify pneumatic system components and symbols used in pneumatic systems.</li> </ol> <p><b>Industrial Systems and Maintenance IV, Unit 10, Troubleshooting and Repairing Pneumatic Equipment Content Standards</b></p> <ol style="list-style-type: none"> <li>10. Perform pneumatic system preventive maintenance procedures.</li> </ol> <p><b>Learning Objectives</b></p> <ol style="list-style-type: none"> <li>1. Demonstrate how to inspect pneumatic systems for leaks and possible problems.</li> <li>2. Explain the purpose of proper lubrication in pneumatic systems.</li> <li>3. Demonstrate the ability to inspect system components for deterioration and damage.</li> </ol> |                |