Alabama Department of Postsecondary Education

Representing the Alabama Community College System

STATEWIDE CAREER/TECHNICAL EDUCATION COURSE ARTICULATION REVIEW MINUTES

Articulation Agreement Identifier: IAT 121 (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): 15.0613

Postsecondary course prefix, number, and title: IAT 121 – Fundamentals of Industrial Hydraulics and Pneumatics

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 15, 2012

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

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

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A2.1.1 Identify procedures for containing and cleaning up hydraulic fluid spills. A2.1.2 Explain how to read and interpret an MSDS. A2.1.3 Explain the appropriate methods for storage and disposal of hydraulic fluids and contaminated materials. A2.1.4 Explain the characteristics of both flammable and fire resistant fluids. **Module A Pneumatic Systems** **Competencies:** B1.0 Perform routine maintenance, troubleshooting and repair on pneumatic systems. **Performance Objectives:** B1.1 Safely inspect, maintain, troubleshoot, and remove and replace defective components of a specified pneumatic system. **Learning Objectives:** B1.1.1 Define Pneumatics. B1.1.2 Describe the purpose of a typical pneumatic system. B1.1.3 Identify the components of a typical pneumatic system. B1.1.4 Describe the function of each component. B1.1.5 Identify symbols used in diagrams of pneumatic systems. B1.1.6 Interpret schematic diagrams of pneumatic systems. B1.1.7 Summarize the pneumatic system preventive maintenance procedures. B1.1.8 Discuss the various methods of air preparation (ie	25. Explain air humidity and air dehydration, including after-coolers and air dryers. 26. Describe the operation and function of various actuators. **Learning Objectives** 1. Identify properties of gases. 2. Explain compressed air theory relative to industrial maintenance. 3. Identify units related to pressure and volume. 4. Explain Bernoulli's Principle. 5. Describe types of compressors and accessories. 6. Explain air humidity and air dehydration, including after-coolers and air dryers. 7. Identify different types of actuators and their applications. **Industrial Systems and Maintenance III, Unit 3-8, Basic Pneumatic Systems** **Content Standards** 3. Explain pneumatic safety and physical characteristics of gases. 4. Explain the pneumatic transmission of energy related to basic pneumatic systems. 5. Explain principles of compressor operation and compressed gases. 6. Explain various types of compressors used in pneumatic systems. 7. Explain compressed-air treatment used in pneumatic systems. 8. Explain pneumatic system components and symbols used in pneumatic systems. **Learning Objectives**	

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purpose, receiver sizing, and specialized requirements for sterile processes). B1.1.9 Summarize the lubrication of pneumatic systems and pneumatic tools. B1.1.10 Explain the operation of a typical pneumatic system. B1.1.11 Summarize the process of troubleshooting a pneumatic system.	1. Demonstrate pneumatic safety procedures. 2. Describe the physical characteristics of gases. 3. Explain the pneumatic transmission of energy related to basic pneumatic systems. 4. List the principles of compressor operation and compressed gasses. 5. Identify various types of compressors used in pneumatic systems. 6. Describe compressed-air treatment used in pneumatic systems. 7. Identify pneumatic system components and symbols used in pneumatic systems. **Industrial Systems and Maintenance IV, Unit 10, Troubleshooting and Repairing Pneumatic Equipment Content Standards** 10. Perform pneumatic system preventive maintenance procedures. **Learning Objectives** 1. Demonstrate how to inspect pneumatic systems for leaks and possible problems. 2. Explain the purpose of proper lubrication in pneumatic systems. 3. Demonstrate the ability to inspect system components for deterioration and damage.	