Alabama Department of Postsecondary Education

Representing the Alabama Community College System

STATEWIDE CAREER/TECHNICAL EDUCATION COURSE ARTICULATION REVIEW MINUTES

Articulation Agreement Identifier: INT 103 (2011-1) Identifier is the postsecondary course prefix followed by Plan-of-Instruction version number (e.g.; INT 100 (2007-1)).

Applicable CIP code(s): 47.0303

Postsecondary course prefix, number, and title: INT 103 AC Fundamentals

Secondary Education course(s) title and number: 431510/430059 - Alternating Current

Initial Review: October 15, 2009 DPE Annual Review: February 23, 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.**

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Postsecondary Course Objectives	Secondary Courses and Objectives	TEDAC Comments
Module A Principles of AC Electricity **Competency:** A1.0 Explain elements of AC electrical theory. **Performance Objective** This competency is measured cognitively. **Learning Objectives:** A1.1.1 Identify the particles in an atom. A1.1.2 State the electrical charge of the atomic particles. A1.1.3 Define voltage, current, resistance, and power. A1.1.4 State the units of measurement for voltage, current, resistance, and power. A1.1.5 Describe the relationship between, voltage, current, resistance, and power. A1.1.6 Explain the function of voltage sources. A1.1.7 State Ohm's Law. A1.1.8 State the Power Law. A1.1.9 State Kirchoff's Law as applied to AC theory A1.1.10 Describe the relationship between electricity and magnetism. A1.1.11 Explain the operation of an electromagnet. A1.1.12 Explain how magnetic induction works. A1.1.13 Identify a sine wave. A1.1.14 Describe period, frequency, and amplitude. A1.1.15 State the unit of measurement for frequency. A1.1.16 Describe peak, peak-to-peak, and effective voltage. A1.1.17 Describe phase relationships and phase-shift A1.1.18 Define capacitance. A1.1.19 State the unit of measurement for capacitance. A1.1.20 Define reactance. A1.1.21 Define inductance. A1.1.22 State the unit of measurement for inductance. A1.1.23 Describe the function of an inductor in a circuit.	**Alternating Current** **Unit 1-2 – Terminology and Symbols** **Content Standard(s)** 1. Explain electrical terms, including alternating current, frequency, period, sine wave, capacitance, and inductance. 2. Interpret electrical symbols. **Learning Objective(s)** 1. Define and explain electrical terms. 2. Identify and interpret common electrical symbols. **Unit 3 – Magnetism** **Content Standard(s)** 3. Explain terms and principles of electromagnetism, including permeability, retentivity, and inductance. **Learning Objective(s)** 1. Define magnetism. 2. Explain the function of magnetism in electricity. 3. Define magnetic units. 4. Identify magnetic units. 5. Explain the function of magnetic units in electricity. 6. Define electromagnetic induction. 7. Identify electromagnetic units. 8. Explain electromagnetic induction. 9. Define permeability. 10. Explain permeability. 11. Define retentivity. 12. Explain retentivity. 13. Define inductance. 14. Explain inductance. **Unit 4-6 – Electrical Quantities** **Content Standard(s)** 4. Explain electrical quantities, including frequency, impedance, power, capacitance, inductance, voltage, current, watts, and periods. 5. Measure electrical units, including volts, amperes, ohms, and	

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Competency: A2.0 Perform tasks in a safe manner. **Performance Objective** A2.1 Given a variety of lab situations, perform assigned tasks in a safe manner. **Learning Objectives:** A2.1.1 Identify personal protective equipment. A2.1.2 Explain the use of personal protective equipment. A2.1.3 Explain hazards associated with electrical systems. A2.1.4 Explain lockout/tag out procedures. **Competency:** A3.0 Value the importance of following safety precautions. **Performance Objective** A3.1 This competency is measured affectively. **MODULE B – AC Electrical Circuits** **Competency:** B1.0 Read and interpret electrical circuits. **Performance Objectives:** B1.1 Design and construct a variety of AC circuits. **Learning Objectives:**	hertz. 6. Determine electrical quantities utilizing test equipment, including volts, frequency and period, amperes, and power. **Learning Objective(s)** See above **Unit 7-8 -** Ohm's Law in Alternating Current Circuits **Learning Objective(s)** 1. Draw a schematic diagram of an AC series circuit. 2. Draw a schematic diagram of an AC parallel circuit. 3. Draw a schematic diagram of an AC Series Parallel Circuit. 4. Use common test equipment to analyze an AC series circuit. 5. Use common test equipment to analyze a parallel circuit according to specifications. 6. Use common equipment to analyze a series-parallel circuit according to specifications. 7. Use a function generator to set the required voltage and frequency for a function generator. 8. Use a digital multimeter and an oscilloscope to perform an operational checkout of an AC circuit. 9. Use a digital multimeter to troubleshoot an AC circuit and identify the malfunction. 10. Use an oscilloscope to troubleshoot an AC circuit and identify the malfunction. 11. Construct an AC Parallel Circuit containing resistors, capacitors, inductors, or combinations thereof, and test for continuity. 12. Construct an AC Series-Parallel Circuit containing resistors, capacitors, inductors or combinations thereof, and test for continuity. **Unit 8-12 – Reactive Circuits** **Content Standard(s)** 8. Solve resistive-capacitive circuits. 9. Solve resistive-inductive circuits. 10. Solve resistive-capacitive-inductive circuits. 11. Analyze filter circuits to determine electrical values, including	

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B1.1.1 Explain terms and symbols used for electrical circuits. B1.1.2 State the basic components of an electrical circuit. B1.1.3 Identify characteristics of conductors of different capacities. B1.1.4 Describe the differences between schematic and wiring diagrams. B1.1.5 Differentiate between series, parallel, series-parallel circuits, and RCL circuits. B1.1.6 Explain considerations for using various types of connections when constructing AC circuits. **MODULE C – Circuit Testing** **Competency:** C1.0 Use electrical test equipment to troubleshoot electrical circuits. **Performance Objectives** C1.1 Given an AC circuit previously developed by the student, use various instruments to test the circuit to determine if the readings are in accordance with specifications. **Learning Objectives** C1.1.1 Explain the characteristics and functions of various instruments used to test electrical circuits. C1.1.2 Explain procedures for obtaining readings from various instruments used to test electrical circuits. **Performance Objectives** C1.2 Given various faulty circuits or faulty readings within a circuit, determine the root cause and propose a solution **Learning Objectives** C1.2.1 Describe the process for determining if a reading is correct or incorrect. C1.2.2 Explain the procedures for determining the cause of the malfunction.	hi-pass, low-pass, band pass, and band stop. 12. Demonstrate troubleshooting techniques for evaluating reactive circuits. **Learning Objective(s)** 1. Explain the function of inductance. 2. Define inductive reactance. 3. Explain the function of inductive reactance. 4. Identify inductive circuits. 5. Define capacitive reactance. 6. Explain the function of capacitive reactance. 7. Identify capacitive circuits. 8. Identify open circuits in AC circuits. 9. Identify short circuits in AC circuits. 10. Define RC time constants. 11. Explain the function of RC time constants. 12. Define LR time constants. 13. Explain the function of LR time constants. 14. Explain the use of complex numbers for Alternating current circuits. 15. State the purpose of transformers. 16. Differentiate between transformers. 17. Explain the characteristics of transformers. 18. Define resonance. 19. Explain the function of resonance. 20. Define filters. 21. Explain the function of filters. 22. Describe the voltage and current phase relationship in a resistive AC circuit. 23. Describe the voltage and current transients that occur in an inductive circuit. 24. Define inductive reactance and state how it is affected by frequency. 25. Describe the voltage and current transients that occur in a	

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C1.2.3 Explain the procedures for repairing the malfunction. **Module D Transformers** **Competency:** D1.0 Use transformers in an industrial setting. **Performance Objectives** D1.1 Perform transformer wiring functions for various applications. **Learning Objectives** D1.1.1 Describe the difference between mutual induction and self induction. D1.1.2 Differentiate between the input side and load side of a transformer. D1.1.3 Define Impedance. D1.1.4 Identify various transformer types such as step up, step down, single phase, auto transformers, and polyphase. D1.1.5 Explain the operation of transformers including action and counter action of the primary and secondary magnetic fields. D1.1.6 Explain the function of a center tap. D1.1.7 Calculate primary and secondary ratios for voltage, current, turns, power, and impedance. D1.1.8 Identify primary leads, secondary leads, and transformer polarity from a schematic diagram. D1.1.9 Differentiate between delta and wye connections. D1.1.10 Explain the relationship of line current to coil current and line voltage in Wye and Delta configurations of polyphase transformers. D1.1.11 Explain the purpose of isolation in a transformer.	capacitive circuit. 26. Define capacitive reactance and state how it is affected by frequency. 27. Explain the relationship between voltage and current in the following types of AC circuits: • RL circuit • RC circuit • LC circuit • RLC circuit 28. Describe the effect that resonant frequency has on impedance and current flow in a series or parallel Resonant circuit. 29. Define bandwidth and describe how it is affected by resistance in a series or parallel resonant circuit. 30. Explain the following terms as they relate to AC circuits: • True power • Apparent power • Reactive power • Power factor 31. Troubleshoot circuits.	