Alabama Department of Postsecondary Education

Representing the Alabama Community College System

STATEWIDE CAREER/TECHNICAL EDUCATION COURSE ARTICULATION REVIEW MINUTES

Articulation Agreement Identifier: AUM/ASE 110 (2005-1) Identifier is the postsecondary course prefix followed by Plan-of-Instruction version number (e.g.; INT 100 (2005-1)).

Applicable CIP code(s): 47.0604 & 15.0803

Postsecondary course prefix, number, and title: AUM/ASE 110 Electrical and Electronic Systems I

Secondary Course(s) of Study: 471106/570025 - Automotive Electrical & Electronic Systems I + 471107/570026 - Automotive Electrical & Electronic Systems II

Initial Review: October 13, 2009 Annual DPE Review: January 30, 2012 This course was deleted 11/08/11 and will be removed next review cycle.

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.**

Articulation Agreement Identifier: AUM/ASE 110

Postsecondary Course Objectives	Secondary Course(s) and Location(s)	TEDAC Comments
A1.1 Interpret electrical/electronic system concerns; determine necessary action A1.1.1 Describe the elements of an electrical/electronic system A1.1.2 Determine electrical/electronic system concern A1.1.3 Identify proper course of action	**Electrical & Electronic Systems I, Unit 2-5** **Content Standards** 2. Diagnose electrical and electronic system problems. 3. Identify electrical and electronic systems concerns. • Determining necessary action for electrical and electronic systems concerns	
A1.2 Research applicable vehicle and service information, such as electrical/electronic system operation, vehicle service history, service precautions, and technical service bulletins A1.2.1 List resources of vehicle and service information A1.2.2 Explain the process of researching applicable vehicle and service information	4. Research vehicle and service information, including vehicle service history, technical service bulletins, and interpretation of vehicle and major component identification numbers	
A1.3 Locate and interpret vehicle and major component identification numbers (VIN, vehicle certification labels, and calibration decals A1.3.1 Identify standard locations for vehicle and major component identification numbers A1.3.2 Describe the coding systems for vehicle and major component identification numbers A1.3.3 Explain the elements of interpreting vehicle and major component identification numbers	4. Research vehicle and service information, including vehicle service history, technical service bulletins, and interpretation of vehicle and major component identification numbers	
A1.4 Diagnose electrical/electronic integrity for series, parallel and series-parallel circuits using principles of electricity (Ohm's Law) A1.4.1 Explain Ohm's Law	**Electrical & Electronic Systems I, Unit 2-5** **Learning Objectives** Students will: 1. Complete work order to include customer information, vehicle identifying information, customer concern, related service history, cause and correction. 2. Identify and interpret electrical/electronic system concern;	

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A1.4.2 Explain electrical/electronic integrity A1.4.3 Differentiate between series, parallels, and series-parallel circuits A1.4.4 List the elements of diagnosing electrical/electronic integrity A1.4.5 Explain the process of diagnosing electrical/electronic integrity A1.5 Use wiring diagrams during diagnosis of electrical circuit problems A1.5.1 Explain the use of wiring diagrams A1.5.2 Explain the use of wiring diagrams during diagnosis of electrical circuit problems A1.5.3 Explain the process of diagnosis of electrical circuit problems A1.6 Demonstrate the proper use of a digital multimeter during diagnosis of electrical circuit problems A1.6.1 Explain the use of a digital multimeter A1.6.2 Explain the use of a digital multimeter during diagnosis of electrical circuit problems A1.7 Check electrical circuits with a test light; determine necessary action A1.7.1 Explain the use of a test light A1.7.2 Interpret the test light reading A1.7.3 Identify appropriate course of actions based on the test light reading A1.8 Measure source voltage and perform voltage drop tests in electrical/electronic circuits using a voltmeter; determine necessary action A1.8.1 Explain the use of a volt meter A1.8.2 Define source voltage A1.8.3 Explain the process of a voltage drop test	determine necessary action. 3. Research applicable vehicle and service information, such as electrical/electronic system operation, vehicle service history, service precautions, and technical service bulletins. 4. Locate and interpret vehicle and major component identification numbers (VIN, vehicle certification labels, and calibration decals). 5. Diagnose electrical/electronic integrity of series, parallel and series-parallel circuits using principals of electricity Ohm's Law). 6. Use wiring diagrams during diagnosis of electrical circuit problems. 7. Demonstrate the proper use of a digital multi meter [DMM] during diagnosis of electrical circuit problems. 8. Check electrical circuits with a test light; determine necessary action. 9. Measure source voltage and perform voltage drop tests in electrical/electronic circuits using a volt meter; determine necessary action. 10. Measure current flow in electrical/electronic circuits using ammeter; determine necessary action. 11. Check continuity and measure resistance in electrical/electronic circuits and components using an ohmmeter; determine necessary action. 12. Check electrical circuits using fused jumper wires; determine necessary action. 13. Locate shorts, grounds, opens, and resistance problems in electrical/electronic circuits; determine necessary action. 14. Measure and diagnose the cause(s) of excessive key-off battery drain (parasitic draw); determine necessary action. 15. Inspect and test fusible links, circuit breakers, and fuses; determine necessary action. 16. Inspect and test switches, connectors, relays, solenoid solid state devices, and wires of electrical/electronic circuits; perform necessary action.	

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A1.8.4 Identify appropriate course of action based on the results of the voltage drop test A1.9 Measure current flow in electrical/electronic circuits and components using an ammeter; determine necessary action A1.9.1 List equipment needed to measure current flow A1.9.2 Explain the use of an ammeter A1.9.3 Explain current flow in electrical/electronic circuits A1.9.4 Explain the process of measuring current flow in electrical/electronic circuits and components using an ammeter A1.9.5 Identify proper course of action based on ammeter results A1.10 Check continuity and measure resistance in electrical/electronic circuits and components using an ohmmeter; determine necessary action A1.10.1 Explain continuity in electrical/electronic circuits A1.10.2 Explain resistance in electrical/electronic circuits A1.10.3 Explain the use of an ohmeter A1.11 Check electrical circuits using fused jumper wires; determine necessary action A1.11.1 Explain the use of fuse jumper wires A1.11.2 Explain the process of checking electrical circuits using fused jumper wires A1.11.3 Interpret the results of a fused jumper wire test A1.12 Locate shorts, grounds, opens and resistance problems in electrical/electronic circuits; determine necessary action A1.12.1 Define short, ground, opens, and resistance A1.12.2 Explain the process of locating shorts, grounds, opens and resistance problems in electrical/electronic circuits A1.12.3 Identify appropriate course of action to eliminate shorts, grounds, opens and resistance problems in	17. Remove and replace terminal end from connector. **Electrical & Electronic Systems II, Unit 2-3** **Content Standards** 2. Evaluate electrical and electronic systems diagnoses to determine necessary actions. • Verifying customer concerns regarding electric and electrical systems 3. Justify necessary action for electrical and electronic systems concerns. **Learning Objectives** 1. Locate source of system failure. 2. Evaluate source of system failure. 3. Confirm findings and customer concerns. 4. Conduct research and planning to resolve electronic system failure or malfunction. 5. Prepare written plan for repair. 6. Prepare repair estimates.	

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electrical/electronic circuits A1.13 Measure and diagnose the causes of excessive key-off battery drain (parasitic draw); determine necessary action A1.13.1 Define excessive Key-off battery drain (parasitic draw) A1.13.2 List causes of excessive key-off battery drain A1.13.3 Explain the process of measuring and diagnosing the causes of excessive key-off batter drain A1.13.4 Identify appropriate course of action to eliminate excessive key-off battery drain A1.14 Inspect and test fusible links, circuit breakers, and fuses; determine necessary action A1.14.1 Identify fusible links, circuit breakers, and fuses A1.14.2 Identify the location of fusible links, circuit breakers, and fuses A1.14.3 Identify equipment used to test fusible links, circuit breakers, and fuses A1.14.4 Identify inspection criteria for inspecting and testing fusible links, circuit breakers, and fuses A1.14.5 Explain the process of inspecting fusible links, circuit breakers, and fuses A1.14.6 Explain the process of testing fusible links, circuit breakers, and fuses A1.15 Inspect and test switches, connectors, relays, solid state devices, and wires of electrical/electronic circuits; perform necessary action A1.15.1 Identify switches, connectors, relays, solid state devices, and wires A1.15.2 Identify the location of switches, connectors, relays, solid state devices, and wires A1.15.3 Identify equipment used to test switches, connectors, relays, solid state devices, and wires		

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A1.15.4 Identify criteria for inspecting and testing switches, connectors, relays, solid state devices, and wires A1.15.5 Explain the process of inspecting switches, connectors, relays, solid state devices, and wires A1.15.6 Explain the process of testing switches, connectors, relays, solid state devices, and wires A1.16 Repair wiring harnesses and connectors A1.16.1 List the equipment needed to repair wiring harnesses and connectors A1.16.2 Explain the process of repairing wiring harnesses and connectors A1.17 Perform solder repair of electrical wiring A1.17.1 List the equipment needed to perform solder repair of electrical wiring A1.17.2 Explain the process of performing solder repair of electrical wiring **Competency:** B1.0 Diagnose and service battery malfunctions **Objectives:** B1.1 Perform battery state-of-charge test; determine necessary action B1.1.1 Explain the process of a battery state-of-charge test B1.1.2 Identify proper course of action B1.2 Perform battery capacity test; confirm proper battery capacity for vehicle application; determine necessary action B1.2.1 Define battery capacity B1.2.2 Explain the process of performing a batter capacity test B1.2.3 State proper battery capacity B1.2.4 Identify appropriate course of action	**Electrical & Electronic Systems I, Unit 6** **Content Standard** 6. Demonstrate battery state-of-charge tests, including inspecting and cleaning battery cables, connectors, clamps, and hold downs. **Learning Objective** Students will: 1. Perform battery state-of-charge test: determine necessary action. 2. Perform battery capacity (or conductance test); confirm proper battery capacity for vehicle application; determine necessary action. 3. Maintain or restore electronic memory functions. 4. Inspect, clean, fill, and replace battery. 5. Perform slow/fast battery charge. 6. Inspect and clean battery cables, connectors, clamps, and hold downs; repair or replace as needed. 7. Start a vehicle using jumper cables and a battery or auxiliary power supply. 8. Indentify high voltage circuits of electric or hybrid electric vehicle and related safety precautions. 9. Identify electronic modules, security systems and/or radios that require re-initialization or code entry following battery disconnect. 10. Identify hybrid vehicle auxiliary (12v) battery service, repair and test procedures. **Electrical & Electronic Systems II, Unit 4**	

Postsecondary Course Objectives	Secondary Course(s) and Location(s)	TEDAC Comments
B1.3 Maintain or restore electronic memory functions B1.3.1 List electronic memory functions B1.3.2 Summarize the restoration of electronic memory functions B1.4 Inspect, clean, fill, and replace battery B1.4.1 List the elements of inspecting, cleaning, filling, and replacing a battery B1.5 Perform slow/fast battery charge B1.5.1 Define slow/fast battery charge B1.5.2 List equipment needed to perform slow/fast battery charge B1.5.3 Explain the process of performing slow/fast batter charge B1.6 Inspect and clean battery cables connectors, clamps, and hold-downs; repair or replace as needed. B1.6.1 Identify battery cables, connectors, clamps, and hold-downs B1.6.2 Identify inspection criteria B1.6.3 Explain the process of inspecting Identify battery cables, connectors, clamps, and hold-downs B1.6.4 Explain the process of cleaning Identify battery cables, connectors, clamps, and hold-downs B1.7 Start a vehicle using jumper cables and a battery or auxiliary power supply B1.7.1 Identify jumper cables, batter power supply, and an auxiliary power supply B1.7.2 Explain the process of starting a vehicle using Identify jumper cables, batter power supply, and an auxiliary power supply	**Content Standard** 4. Compare appropriate tests and battery service procedures for conventional and hybrid electrical systems. **Learning Objectives** 1. Discuss appropriate tests and battery service procedures for conventional and hybrid electrical systems. 2. Evaluate appropriate tests and battery service procedures for conventional and hybrid electrical systems. 3. Practice troubleshooting battery related problems with electrical systems for conventional and hybrid electrical systems. 4. Practice making appropriate repairs to battery related electrical systems for conventional and hybrid electrical systems. 5. Compare appropriate tests and battery service procedures for conventional and hybrid electrical systems. **Electrical & Electronic Systems I, Unit 7** **Content Standard** • 7. Explain starting system operations and repair. • Performing test procedures for starting systems **Learning Objectives**	

Postsecondary Course Objectives	Secondary Course(s) and Location(s)	TEDAC Comments
Competency: C1.0 Diagnose and repair starting system malfunctions **Objectives:** C1.1 Perform starter current draw tests; determine necessary action C1.1.1 List the equipment needed to perform a starter current draw test C1.1.2 Explain the process of performing starter current draw tests C1.1.3 Identify proper course of action based on the test results C1.2 Perform starter circuit voltage drop tests; determine necessary action C1.2.1 List the equipment needed to perform a starter circuit drop test C1.2.2 Explain the process of performing starter circuit drop tests C1.2.3 Identify proper course of action based on the test results	1. Diagnose and repair starting system malfunctions. 2. Perform starter current draw tests; determine necessary action. 3. Perform starter circuit voltage drop tests; determine necessary action. 4. Inspect and test starter relays and solenoids; determine necessary action. 5. Remove and install starter in a vehicle. 6. Inspect and test switches, connectors, and wires of starter control circuits; perform necessary action. • Differentiate between electrical and engine mechanical problems that cause a slow-crank or no-crank condition. 8. List the equipment needed to perform a starter current draw test. • Explaining the process of performing starter current draw tests • Identifying proper course of action based on the test results 9. List the equipment needed to perform a starter circuit drop test. • Explaining the process of performing starter circuit drop tests • Identifying proper course of action based on the test results 10. List the equipment needed to test starter relays and solenoids. • Explaining the process of inspecting and testing starter relays and solenoids • Identifying proper course of action based on the test results • List tools need to remove and install a starter in a vehicle 11. Explain the process in removing and installing a starter in a vehicle. 12. Identify switches, connectors, and wires of starter control circuits. 13. Identify the location of switches, connectors, and wires of starter control circuits. 14. Identify equipment used to test switches, connectors, and	

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C1.3 Inspect and test starter relays and solenoids; determine necessary action C1.3.1 List the equipment needed to test starter relays and solenoids C1.3.2 Identify inspection criteria C1.3.3 Explain the process of inspecting and testing starter relays and solenoids C1.3.4 Identify proper course of action based on the test results C1.4 Remove and install starter in a vehicle C1.4.1 List tools need to remove and install a starter in a vehicle C1.4.2 Explain the process in removing and installing a starter in a vehicle C1.5 Inspect and test switches, connectors, and wires of starter control circuits; perform necessary action C1.5.1 Identify switches, connectors, and wires of starter control circuits C1.5.2 Identify the location of switches, connectors, and wires of starter control circuits C1.5.3 Identify equipment used to test switches, connectors, and wires of starter control circuits C1.5.4 Identify inspection and test criteria for switches, connectors, and wires of starter control circuits C1.5.5 Explain the process of inspecting and testing switches, connectors and wires of starter control circuits C1.6 Differentiate between electrical and engine mechanical problems that cause a slow-crank or no-crank condition C1.6.1 Identify electrical problems C1.6.2 Identify mechanical problems C1.6.3 Define slow-crank	wires of starter control circuits. 15. Identify inspection and test criteria for switches, connectors, and wires of starter control circuits. • Explain the process of inspecting and testing switches, connectors and wires of starter control circuits. 17. Define slow-crank. 18. Define no-crank condition. **Electrical & Electronic Systems II, Unit 5** **Content Standard** 5. Differentiate between electrical and mechanical problems associated with starting system diagnosis. • Determining service procedures for starting systems **Learning Objectives** 1. Practice evaluating starting systems for mechanical or electrical problems. 2. Practice making appropriate repairs to starting systems. 3. Troubleshooting starting systems. 4. Perform various starting system repairs. **Electrical & Electronic Systems I, Unit 8** **Content Standards** Explain starting system operations and repair. • Explain charging system component operations and repair. **Learning Objectives**	

Postsecondary Course Objectives	Secondary Course(s) and Location(s)	TEDAC Comments
C1.6.4 Define no-crank condition Competency: D1.0 Diagnose and repair charging system malfunctions	1. Diagnose and repair charging system malfunctions 2. Perform charging system output test: determine necessary action 3. Diagnose charging system for the cause of undercharge, no-charge 4. Inspect and test starter relays and solenoids; determine necessary action. 5. Remove and install starter in a vehicle. 6. Inspect and test switches, connectors, and wires of starter control circuits; perform necessary action. • Differentiate between electrical and engine mechanical problems that cause a slow-crank or no-crank condition. 8. List the equipment needed to perform a starter current draw test. • Explaining the process of performing starter current draw tests • Identifying proper course of action based on the test results 9. List the equipment needed to perform a starter circuit drop test. • Explaining the process of performing starter circuit drop tests • Identifying proper course of action based on the test results 10. List the equipment needed to test starter relays and solenoids. • Explaining the process of inspecting and testing starter relays and solenoids • Identifying proper course of action based on the test results • List tools need to remove and install a starter in a vehicle 11. Explain the process in removing and installing a starter in a vehicle. 12. Identify switches, connectors, and wires of starter control circuits. 13. Identify the location of switches, connectors, and wires of starter control circuits.	

Postsecondary Course Objectives	Secondary Course(s) and Location(s)	TEDAC Comments
Objectives: D1.1 Perform charging system output test; determine necessary action D1.1.1 List the equipment needed to perform a charging system output test D1.1.2 Explain the process of performing charging system output tests D1.1.3 Identify proper course of action based on the test results D1.2 Diagnose charging system for the cause of undercharge, no-charge, and overcharge conditions D1.2.1 Differentiate between undercharge, no-charge, and over charge conditions D1.2.2 Explain the process of diagnosing charging system for the cause of undercharge, no-charge, and overcharge conditions D1.3 Inspect, adjust, or replace generator (alternator) drive belts, pulleys, and tensioners; check pulley and belt alignment D1.3.1 Identify the location of generators, drive belts, pulleys, and tensioners D1.3.2 Identify inspection criteria for generators, drive belts, pulleys, and tensioners D1.3.3 Explain the process to inspect, adjust, or replace generator, drive belts, pulleys, and tensioners D1.4 Remove, inspect, and install generator (alternator) D1.4.1 Locate the generator D1.4.2 Identify inspection criteria for a generator D1.4.3 Explain the process to remove, inspect, and install a	14. Identify equipment used to test switches, connectors, and wires of starter control circuits. 15. Identify inspection and test criteria for switches, connectors, and wires of starter control circuits. • Explain the process of inspecting and testing switches, connectors and wires of starter control circuits. 17. Define slow-crank. 18. Define no-crank condition. **E & E Systems II, Unit 6** **Content Standard** 6. Diagnose charging systems to determine corrective action. **Learning Objectives** 1. Practice evaluating charging systems for mechanical or electrical problems. 2. Practice making appropriate repairs to charging systems. 3. Troubleshooting charging systems. 4. Perform various charging system repairs. **Electrical & Electronic Systems I, Unit 9** **Content Standards** 9. Analyze lighting systems to determine necessary repair. **Learning Objectives** 1. Diagnose and repair lighting system malfunctions. 2. Diagnose the cause of brighter than normal, intermittent, dim, or no light operation; determine necessary action. 3. Inspect, replace, and aim headlights and bulbs. 4. Inspect and diagnose incorrect turn signal or hazard light operation; perform necessary action.	

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generator D1.5 Perform charging circuit voltage drop tests; determine necessary action D1.5.1 List the equipment needed to perform a charging circuit voltage drop test D1.5.2 Explain the process of performing charging circuit voltage drop tests D1.5.3 Identify proper course of action based on the test results **Competency:** E1.0 Diagnose and repair lighting system malfunctions **Objectives:** E1.1 Diagnose the cause of brighter than normal, intermittent, dim, or no light operation; determine necessary action E1.1.1 Define brighter than normal, intermittent, dim, and no light operation E1.1.2 List possible causes of brighter than normal, intermittent, dim, and no light operation E1.1.3 Explain the process of diagnosing the cause of brighter than normal, intermittent, dim, or no light operation; determine necessary action E1.2 Inspect, replace, and aim headlights and bulbs E1.2.1 Identify inspection criteria for headlights and bulbs E1.2.2 Summarize the process of inspecting, replacing, and aiming headlights and bulbs	5. Define brighter than normal, intermittent, dim, and no light operation. 6. List possible causes of brighter than normal, intermittent, dim, and no light operation. 7. Explain the process of diagnosing the cause of brighter than normal, intermittent, dim, or no light operation and determine necessary action. 8. Identify inspection criteria for headlights and bulbs. 9. Summarize the process of inspecting, replacing, and aiming headlights and bulbs. 10. Identify incorrect turn signal. 11. Identify inspection criteria for turn signals and head lights. 12. Explain the process of inspecting and diagnosing incorrect turn signal or hazard light operation. **Electrical & Electronic Systems II, Unit 7** **Content Standard** 7. Determine procedures for lighting system repairs. • Identifying safety hazards associated with high intensity components **Learning Objectives** 1. Practice evaluating lighting systems for mechanical or electrical problems. 2. Practice making appropriate repairs to lighting systems. 3. Troubleshoot lighting systems. 4. Perform various lighting system repairs. 5. Identify safety hazards associated with high intensity components.	

Postsecondary Course Objectives	Secondary Course(s) and Location(s)	TEDAC Comments
E1.3 Inspect and diagnose incorrect turn signal or hazard light operation; perform necessary action E1.3.1 Identify incorrect turn signal E1.3.2 Identify inspection criteria for turn signals and head lights E1.3.3 Explain the process of inspecting and diagnosing incorrect turn signal or hazard light operation		