

ILLINOIS VALLEY COMMUNITY COLLEGE



COURSE OUTLINE

DIVISION: Workforce Development

COURSE: ATO 2210; Advanced Engine Performance and Driveability

Date: Spring 2014

Credit Hours: 5

Prerequisite(s): ATO 1210, 1220, 1250 or consent of instructor

Delivery Method:

<input checked="" type="checkbox"/> Lecture	2 Contact Hours (1 contact = 1 credit hour)
<input type="checkbox"/> Seminar	0 Contact Hours (1 contact = 1 credit hour)
<input checked="" type="checkbox"/> Lab	6 Contact Hours (2 contact = 1 credit hour)
<input type="checkbox"/> Clinical	0 Contact Hours (3 contact = 1 credit hour)
<input type="checkbox"/> Online	
<input type="checkbox"/> Blended	

Offered: Fall Spring Summer

IAI Equivalent –**Only for Transfer Courses**–go to <http://www.itransfer.org>.

CATALOG DESCRIPTION:

This is an advanced tune-up class that covers distributor, distributorless, optical, and coil-on-plug electronic ignition systems. Computer controlled electronic spark advance systems will be explained. Students will service vehicles during lab sessions and diagnose driveability problems using the 4-gas analyzer, regular oscilloscope, digital storage oscilloscope and scanner. Students will be taught how to do a proper tune-up and solve engine performance problems such as lack of engine power, poor fuel economy, and engine driveability issues.

GENERAL EDUCATION GOALS ADDRESSED

[See the last page of this form for more information.]

Upon completion of the course, the student will be able:

[Choose those goals that apply to this course.]

- To apply analytical and problem solving skills to personal, social and professional issues and situations.
- To communicate orally and in writing, socially and interpersonally.
- To develop an awareness of the contributions made to civilization by the diverse cultures of the world.
- To understand and use contemporary technology effectively and to understand its impact on the individual and society.
- To work and study effectively both individually and in collaboration with others.
- To understand what it means to act ethically and responsibly as an individual in one's career and as a member of society.
- To develop and maintain a healthy lifestyle physically, mentally, and spiritually.
- To appreciate the ongoing values of learning, self-improvement, and career planning.

EXPECTED LEARNING OUTCOMES AND RELATED COMPETENCIES:

[Outcomes related to course specific goals.]

Upon completion of the course, the student will be able to:

I. Engine Repair Tasks (NATEF)

A. General Engine Diagnosis; Removal and Reinstallation (R & R)

I.A.7. Perform cylinder compression tests; determine necessary action.

I.A.8. Perform cylinder leakage tests; determine necessary action.

I.A.9. Perform cylinder compression tests; determine necessary action.

I.A.10. Perform cylinder leakage tests; determine necessary action.

VI. Electrical/Electronic Systems Tasks (NATEF)

A. General Electrical System Diagnosis

VI.A.3. Locate and interpret vehicle and major component identification numbers (VIN, vehicle certification labels, and calibration decals).

VI.A.4. Diagnose electrical/electronic integrity for series, parallel and series-parallel circuits using principles of electricity (Ohm's Law).

VI.A.5. Use wiring diagrams during diagnosis of electrical circuit problems.

VI.A.6. Demonstrate the proper use of a digital multimeter (DMM) during diagnosis of electrical circuit problems.

VI.A.7. Check electrical circuits with a test light; determine necessary action.

VI.A.8. Measure source voltage and perform voltage drop tests in electrical/electronic circuits using a voltmeter; determine necessary action.

VI.A.9. Measure current flow in electrical/ electronic circuits and components using an ammeter; determine necessary action.

VI.A.10. Check continuity and measure resistance in electrical/electronic circuits and components using an ohmmeter; determine necessary action.

VI.A.11. Check electrical circuits using jumper wires; determine necessary action.

VI.A.12. Locate shorts, grounds, opens, and resistance problems in electrical/electronic circuits; determine necessary action.

VI.A.14. Inspect and test fusible links, circuit breakers, and fuses; determine necessary action.

VI.A.15. Inspect and test switches, connectors, relays, solid state devices and wires of electrical/electronic circuits; perform necessary action.

VIII. Engine Performance Tasks (NATEF)

A. General Engine Diagnosis

VIII.A.1. Identify and interpret engine performance concern; determine necessary action.

VIII.A.2. Research applicable vehicle and service information, such as engine management system operation, vehicle service history, service precautions, and technical service bulletins.

VIII.A.3. Locate and interpret vehicle and major component identification numbers (VIN, vehicle certification labels, and calibration decals).

VIII.A.5. Diagnose abnormal engine noise or vibration concerns; determine necessary action.

VIII.A.7. Perform engine absolute (vacuum/boost) manifold pressure tests; determine necessary action.

VIII.A.8. Perform cylinder power balance test; determine necessary action.

VIII.A.9. Perform cylinder compression test; determine necessary action.

VIII.A.10. Perform cylinder leakage test; determine necessary action.

VIII.A.11. Diagnose engine mechanical, electrical, electronic, fuel and ignition problems with an oscilloscope and engine diagnostic equipment; determine necessary action.

VIII.A.12. Prepare 4 or 5 gas analyzer; inspect and prepare vehicle for test, and obtain exhaust readings; interpret readings and determine necessary action.

B. Computerized Engine Controls Diagnosis and Repair

VIII.B.1. Retrieve and record stored OBD I diagnostic trouble codes; clear codes.

VIII.B.2. Retrieve and record stored OBD II diagnostic trouble codes; clear codes.

VIII.B.3. Diagnose the causes of emissions or driveability concerns resulting from malfunctions in the computerized engine controls with stored diagnostic trouble codes.

VIII.B.4. Diagnose emissions or driveability concerns resulting from failure of computerized engine controls with no stored diagnostic trouble codes; determine necessary action.

VIII.B.6. Inspect and test computerized engine control system sensors, powertrain control module (PCM), actuators, and circuits using a graphing multimeter (GMM)/digital storage oscilloscope (DSO); perform necessary action.

VIII.B.7. Obtain and interpret scan tool data.

VIII.B.8. Access and use service information to perform step-by-step diagnosis.

VIII.B.9. Diagnose driveability and emissions problems resulting from failures of interrelated systems (cruise control, security alarms, torque controls, suspension controls, traction controls, A/C, automatic transmissions, non-OEM-installed accessories or similar systems); determine necessary action.

C. Ignition System diagnosis and Repair

VIII.C.1. Diagnose ignition system related problems such as no-starting, hard starting, engine misfire, poor driveability, spark knock, power loss, poor mileage, and emissions concerns on vehicles with electronic ignition (distributorless) systems; determine necessary action.

VIII.C.2. Diagnose ignition system related problems such as no-starting, hard starting, engine misfire, poor driveability, spark knock, power loss, poor mileage, and emissions concerns on vehicles with distributor ignition (DI) systems; determine necessary action.

VIII.C.3. Inspect and test ignition primary circuit wiring and solid state components; perform necessary action.

VIII.C.4. Inspect, test, and service distributor.

VIII.C.5. Inspect and test ignition system secondary circuit wiring and components; perform necessary action.

VIII.C.6. Inspect and test ignition coil(s); perform necessary action.

VIII.C.7. Check and adjust ignition system timing and timing advance/retard (where applicable).

VIII.C.8. Inspect and test ignition system pick up sensor or triggering devices; perform necessary action.

COURSE TOPICS AND CONTENT REQUIREMENTS:

Provided a vehicle, a service manual, the proper tools and equipment, the student will be able to perform the following performance objectives after instruction in the classroom and a demonstration in lab:

1. Road test the vehicle.
2. Connect the oscilloscope correctly to any vehicle.
3. Interpret primary and secondary normal waveforms on the oscilloscope.
4. Interpret abnormal oscilloscope patterns.
5. Perform the following area engine mechanical tasks correctly:
 - a. Use a vacuum gauge correctly.
 - b. Cranking vacuum test.
 - c. Cranking speed test.
 - d. Manifold vacuum test.
 - e. Ported vacuum test.
 - f. Cylinder power balance test.
 - g. Compression test.
 - h. Cylinder leakage test.
6. Diagnose various engine noises.
7. Diagnose excessive engine oil consumption.
8. Demonstrate the proper hookup and use of the following:
 - a. dwell meter
 - b. tachometer
 - c. timing light
 - d. voltmeter
 - e. ohmmeter
 - f. distributor
 - g. infra-red exhaust analyzer
 - h. VAT 40 tester
9. Correctly set initial timing and test both spark advance systems.
10. Adjust curb idle speed, idle stop solenoid, and idle speed control motor.
11. Adjust timing by the average or magnetic timing method.
12. Inspect and check spark plug wire resistance accurately with an ohmmeter.

13. Test and/or replace ballast resistor.
14. Diagnose the causes for abnormal HC, CO, O₂, CO₂ readings
15. Adjust air/fuel mixture accurately with a vacuum gauge.
16. Adjust air/fuel mixture accurately with a 4-gas analyzer.
17. Diagnose computer controlled and imported ignition systems.
18. Perform individually at least one major tune-up during the semester.
19. Properly remove and test a standard and electronic distributor then correctly re-install the distributor.
20. Accurately test the electronic control module used on GM, Ford, and Chrysler.
21. Properly use "Bear ACE" computerized engine tester.

COURSE CONTENT:

LECTURE:

- I. Engine Design
 - A. 2 and 4 - stroke cycle
 - B. Cylinder arrangement
 - C. Firing orders
- II. Oscilloscope Tester
 - A. Purpose
 - B. Primary waveform interpretation
 - C. Secondary waveform interpretation
 - D. Controls
 - E. Firing order
 - F. Abnormal scope patterns
 - G. Electronic ignition patterns
- III. Major Tune-Up
 - A. What it consists of
 - B. How to adjust air/fuel mixture screws
- IV. Engine Mechanical Condition
 - A. Cranking vacuum test
 - B. Cranking speed test
 - C. Manifold test
 - D. Ported vacuum test
 - E. Cylinder power balance test
 - F. Compression test
 - G. Cylinder leakage test
 - H. Exhaust restriction test
- V. Oil Consumption Diagnosis
 - A. Diluted oil
 - B. Worn valve guides
 - C. Defective valve seals
 - D. Plugged P.C.V. system
 - E. Leaking oil pressure sending unit
 - F. Worn piston rings
 - G. Gasket leaks
 - H. Leaking rear main seal
- VI. Abnormal Combustion Diagnosis

- A. Define normal combustion
- B. How to diagnose detonation
- C. How to diagnose pre-ignition
- VII. Engine Noise Diagnosis
 - A. Crankshaft bearing knock
 - B. Connecting rod knock
 - C. Noisy valve train
 - D. Piston slap
 - E. Loose piston pins
 - F. Timing gear and chain
- VIII. Operation of the Standard Ignition System
 - A. Purpose
 - B. Components
 1. Battery
 2. Ignition switch
 3. Ballast resistor
 4. Ignition coil
 5. Breaker points
 6. Condenser
 7. Distributor cap and rotor
 8. Spark plug wires
 9. Spark plug
 10. Ground
 - C. Dwell
 - D. Theory of operation
 1. Primary circuit
 2. Secondary circuit
 3. Condenser circuit
 - E. Spark advances
 1. Vacuum
 2. Centrifugal
 - F. Troubleshooting standard ignition
- IX. Operation of the Electronic Ignition System
 - A. Need for electronic ignition
 - B. Components
 1. Battery
 2. Ignition switch
 3. Ballast resistor
 4. Ignition coil
 5. Capacitor
 6. Timer core
 7. Pole piece
 8. Reluctor
 9. Armature
 10. Pick-up coil
 11. Electronic module
 12. Distributor cap and rotor
 13. Electronic spark plug wires
 14. Spark plug

- 15. Ground
- C. Theory of General Motor's High Electronic Ignition (HEI)
 - 1. Ignition coil primary circuit
 - 2. Module circuit
 - 3. Module - pickup - coil circuit
 - 4. Spark plug secondary circuit
- D. Theory and operation of:
 - 1. Magnetic pulse
 - 2. Hall effect
 - 3. BID - AMC
- E. Computer controlled ignition and fuel systems
 - 1. Introduction to microprocessors
 - 2. Chrysler lean burn and electronic spark control
 - 3. Ford Electronics Engine Control (EEC)
 - 4. General Motors Electronic Spark Timing (EST)
 - 5. General Motors Electronic Spark Selection (ESS)
 - 6. General Motors Computer Control Command System (CCC)
- F. Imported car ignition system
 - 1. Nissan ignition systems
 - 2. Honda electronic ignition system
 - 3. Toyota electronic ignition systems
 - 4. Volkswagon electronic ignition systems
- G. Troubleshooting electronic ignition
- X. Engine Timing
 - A. Initial
 - B. Average
 - C. Magnetic
 - D. Centrifugal and vacuum
 - E. Electronic spark timing
- XI. Purpose Of and How to Use the Following Diagnostic Equipment
 - A. Dwell meter
 - B. Timing light
 - C. Voltmeter
 - D. Tachometer
 - E. Ohmmeter
 - F. Coil tester
 - G. Condenser tester
 - H. Vacuum gauge
 - I. Exhaust analyzer tester HC, CO, O2, CO2.
 - J. Distributor tester
- XII. Starting Systems
 - A. Why two starting units
 - 1. Starter circuit
 - 2. Control circuit
 - B. Starter motor operation
 - C. Types of starter driver
 - D. Starter system tests
 - 1. Battery load
 - 2. Starter current draw

- 3. Cranking voltage
- E. Safety switches
- F. Troubleshooting starter motors
- XIII. Charging System Tests
 - A. VAT 40 tester
 - B. Battery Condition
 - C. Alternator output
 - D. Voltage regulator output
 - E. Diode/starter test

LAB

The instructor will demonstrate the proper method to perform the following diagnostic tests. Then the student must do the same diagnostic tests to aid the student in locating the engine malfunction.

- I. Explanation of Oscilloscope Patterns
 - A. Oscilloscope controls and hookup
 - B. Primary waveform interpretation
 - C. Secondary waveform interpretation
 - D. Alternator diode pattern interpretation
- II. Major Tune-Up
 - A. Define
 - B. Must individually complete one major tune-up during the semester.
- III. Engine Mechanical Tests
 - A. How to use a vacuum gauge
 - B. Cranking vacuum test
 - C. Cranking speed test
 - D. Manifold vacuum test
 - E. Ported vacuum test
 - F. Cylinder power balance
 - G. Compression test
 - H. Cylinder leakage test
- IV. Engine Noise Diagnostic Tests
 - A. Noise valve train
 - B. Crankshaft bearing knock
 - C. Connecting rod knock
 - D. Piston slap
 - E. Loose piston pins
 - F. Defective timing chain
- V. Oil Consumption Diagnostic Tests
 - A. Defective valve seals
 - B. Worn piston rings
 - C. Worn valve guides
 - D. Plugged PCV system
 - E. Leaking rear main seal
 - F. Leaking oil pan gasket
 - G. Leaking valve cover gaskets
 - H. Leaking oil pressure sending unit

- VI. Dwell Meter
 - A. Operation and hookup
 - B. Calibration
 - C. Dwell variation test
 - D. Distributor resistance
 - E. Adjust dwell
- VII. Tachometer
 - A. Operation and hookup
 - B. PCV test
 - C. Set initial timing
 - D. Adjust idle speed
 - E. Adjust idle stop solenoid
- VIII. Timing Light
 - A. Initial timing
 - B. Magnetic timing
 - C. Average timing
 - D. Centrifugal and vacuum advance timing units
 - E. Electronic spark timing
- IX. Voltmeter
 - A. Operation and hookup
 - B. Cranking voltage
 - C. Voltage drop
 - D. Cranking coil output
 - E. Charging voltage
- X. Ohmmeter
 - A. Operation and hookup
 - B. Ignition coil primary resistance
 - C. Ignition coil secondary resistance
 - D. Spark plug wire resistance
 - E. Test ballast resistor
 - F. Test for open circuits
- XI. Condenser Tests
 - A. Operation and hookup
 - B. Capacity test (microfarad)
 - C. Leakage test
 - D. Series resistance test
- XII. Infra-Red Exhaust Analyzer
 - A. Operation and hookup
 - B. Diagnose high HC, CO, O₂, CO₂ readings
 - C. Diagnose high CO (carbon monoxide) readings
 - D. Adjust air/fuel mixture
- XIII. Distributor
 - A. Proper removal and installation
 - B. Proper use of distributor tester
 - C. Complete electronic distributor worksheet
 - D. Test electronic ignition components
 - E. Troubleshoot electronic ignition malfunctions
- XIV. VAT 28/40 Tester
 - A. Operation and hookup

- B. Complete VAT 28/40 worksheet
 - C. Test alternator output
 - D. Test voltage regulator output
- XV. Electronic Ignition Module
- A. Test electronic module in car
 - B. Test electronic module on bench
 - C. Test results - interpretation

INSTRUCTIONAL METHODS:

- 1. Lecture
- 2. Demonstration
- 3. Filmstrips
- 4. Films
- 5. Reading assignments
- 6. Exams
- 7. Quizzes
- 8. Handouts
- 9. Transparencies

INSTRUCTIONAL MATERIALS:

- 1. Russell Carrigan; Richard Kent. "Tech One: Automotive Engine Performance." Thomson Publishing Company, 2005, 1st Edition.

STUDENT REQUIREMENTS AND METHODS OF EVALUATION:

- 1. Complete all lab objectives (NATEF Tasks).
- 2. Pass written exams and quizzes.
- 3. Student evaluation form for live lab performance objectives.
- 4. Safe work habits.
- 5. Hands on experience.
- 6. Attendance.
- 7. Class participation.
- 8. Current events.
- 9. Group presentation on electronic ignition.

OTHER REFERENCES

Course Competency/Assessment Methods Matrix

ATO 2210; Advanced Engine Performance and Driveability	Assessment Options																															
For each competency/outcome place an "X" below the method of assessment to be used.	Assessment of Student Learning	Article Review	Case Studies	Group Projects	Lab Work	Oral Presentations	Pre-Post Tests	Quizzes	Written Exams	Artifact Self Reflection of Growth	Capstone Projects	Comprehensive Written Exit Exam	Course Embedded Questions	Multi-Media Projects	Observation	Writing Samples	Portfolio Evaluation	Real World Projects	Reflective Journals	Applied Application (skills) Test	Oral Exit Interviews	Accreditation Reviews/Reports	Advisory Council Feedback	Employer Surveys	Graduate Surveys	Internship/Practicum /Site Supervisor Evaluation	Licensing Exam	In Class Feedback	Simulation	Interview	Written Report	Assignment
Assessment Measures – Are direct or indirect as indicated. List competencies/outcomes below.	Direct/ Indirect	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	I	I	I	I	D	D							
I.A.7. Engine Repair Tasks- Perform cylinder compression tests; determine necessary action.				X																												
I.A.8. Engine Repair Tasks- Perform cylinder leakage tests; determine necessary action.				X																												
I.A.9. Engine Repair Tasks- Perform cylinder compression tests; determine necessary action.				X																												
I.A.10. Engine Repair Tasks- Perform cylinder leakage tests; determine necessary action.				X																												
VI.A.3. Electrical/Electronic Systems Tasks - Locate and interpret vehicle and major component identification numbers (VIN, vehicle certification labels, and calibration decals).				X		X	X																									

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VI.A.4. Electrical/Electronic Systems Tasks - Diagnose electrical/electronic integrity for series, parallel and series-parallel circuits using principles of electricity (Ohm's Law).					X			X	X																															
VI.A.5. Electrical/Electronic Systems Tasks - Use wiring diagrams during diagnosis of electrical circuit problems.					X			X	X																															
VI.A.6. Electrical/Electronic Systems Tasks - Demonstrate the proper use of a digital multimeter (DMM) during diagnosis of electrical circuit problems.					X			X	X																															
VI.A.7. Electrical/Electronic Systems Tasks - Check electrical circuits with a test light; determine necessary action.					X			X	X																															
VI.A.8. Electrical/Electronic Systems Tasks - Measure source voltage and perform voltage drop tests in electrical/electronic circuits using a voltmeter; determine necessary action.					X			X	X																															

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VI.A.9. Electrical/Electronic Systems Tasks - Measure current flow in electrical/ electronic circuits and components using an ammeter; determine necessary action.				X			X	X																								
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VI.A.14. Electrical/Electronic Systems Tasks - Inspect and test fusible links, circuit breakers, and fuses; determine necessary action.					X																											
VI.A.15. Electrical/Electronic Systems Tasks - Inspect and test switches, connectors, relays, solid state devices and wires of electrical/electronic circuits; perform necessary action.				X																												
VIII.A.1. Engine Performance Tasks - Identify and interpret engine performance concern; determine necessary action.				X		X	X																									
VIII.A.2. Engine Performance Tasks - Research applicable vehicle and service information, such as engine management system operation, vehicle service history, service precautions, and technical service bulletins.				X		X	X																									

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VIII.A.10. Engine Performance Tasks - Perform cylinder leakage test; determine necessary action.				X		X	X																									
VIII.A.11. Engine Performance Tasks - Diagnose engine mechanical, electrical, electronic, fuel and ignition problems with an oscilloscope and engine diagnostic equipment; determine necessary action.				X		X	X																									
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VIII.B.1. Engine Performance Tasks - Retrieve and record stored OBD I diagnostic trouble codes; clear codes.				X		X	X																									
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VIII.B.3. Engine Performance Tasks - Diagnose the causes of emissions or driveability concerns resulting from malfunctions in the computerized engine controls with stored diagnostic trouble codes.				X		X	X																									
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VIII.B.6. Engine Performance Tasks - Inspect and test computerized engine control system sensors, powertrain control module(PCM), actuators, and circuits using a graphing multimeter (GMM)/digital storage oscilloscope (DSO); perform necessary action.				X		X	X																									

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For each competency/outcome place an "X" below the method of assessment to be used.	Assessment of Student Learning	Article Review	Case Studies	Group Projects	Lab Work	Oral Presentations	Pre-Post Tests	Quizzes	Written Exams	Artifact Self Reflection of Growth	Capstone Projects	Comprehensive Written Exit Exam	Course Embedded Questions	Multi-Media Projects	Observation	Writing Samples	Portfolio Evaluation	Real World Projects	Reflective Journals	Applied Application (skills) Test	Oral Exit Interviews	Accreditation Reviews/Reports	Advisory Council Feedback	Employer Surveys	Graduate Surveys	Internship/Practicum /Site Supervisor Evaluation	Licensing Exam	In Class Feedback	Simulation	Interview	Written Report	Assignment
Assessment Measures – Are direct or indirect as indicated. List competencies/outcomes below.	Direct/ Indirect	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	I	I	I	I	D	D							
VIII.B.7. Engine Performance Tasks - Obtain and interpret scan tool data.				X		X	X																									
VIII.B.8. Engine Performance Tasks - Access and use service information to perform step-by-step diagnosis.				X		X	X																									
VIII.B.9. Engine Performance Tasks - Diagnose driveability and emissions problems resulting from failures of interrelated systems (cruise control, security alarms, torque controls, suspension controls, traction controls, A/C, automatic transmissions, non-OEM-installed accessories or similar systems); determine necessary action.				X		X	X																									

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For each competency/outcome place an "X" below the method of assessment to be used.	Assessment of Student Learning	Article Review	Case Studies	Group Projects	Lab Work	Oral Presentations	Pre-Post Tests	Quizzes	Written Exams	Artifact Self Reflection of Growth	Capstone Projects	Comprehensive Written Exit Exam	Course Embedded Questions	Multi-Media Projects	Observation	Writing Samples	Portfolio Evaluation	Real World Projects	Reflective Journals	Applied Application (skills) Test	Oral Exit Interviews	Accreditation Reviews/Reports	Advisory Council Feedback	Employer Surveys	Graduate Surveys	Internship/Practicum /Site Supervisor Evaluation	Licensing Exam	In Class Feedback	Simulation	Interview	Written Report	Assignment
Assessment Measures – Are direct or indirect as indicated. List competencies/outcomes below.	Direct/ Indirect	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	I	I	I	I	D	D							
VIII.C.1. Engine Performance Tasks - Diagnose ignition system related problems such as no-starting, hard starting, engine misfire, poor driveability, spark knock, power loss, poor mileage, and emissions concerns on vehicles with electronic ignition (distributorless) systems; determine necessary action.					X			X	X																							
VIII.C.2. Engine Performance Tasks - Diagnose ignition system related problems such as no-starting, hard starting, engine misfire, poor driveability, spark knock, power loss, poor mileage, and emissions concerns on vehicles with distributor ignition (DI) systems; determine necessary action.				X				X	X																							
VIII.C.3. Engine Performance Tasks - Inspect and test ignition primary circuit wiring and solid state components; perform necessary action.				X				X	X																							

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For each competency/outcome place an "X" below the method of assessment to be used.	Assessment of Student Learning	Article Review	Case Studies	Group Projects	Lab Work	Oral Presentations	Pre-Post Tests	Quizzes	Written Exams	Artifact Self Reflection of Growth	Capstone Projects	Comprehensive Written Exit Exam	Course Embedded Questions	Multi-Media Projects	Observation	Writing Samples	Portfolio Evaluation	Real World Projects	Reflective Journals	Applied Application (skills) Test	Oral Exit Interviews	Accreditation Reviews/Reports	Advisory Council Feedback	Employer Surveys	Graduate Surveys	Internship/Practicum /Site Supervisor Evaluation	Licensing Exam	In Class Feedback	Simulation	Interview	Written Report	Assignment	
Assessment Measures – Are direct or indirect as indicated. List competencies/outcomes below.	Direct/ Indirect	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	I	I	I	I	D	D								
VIII.C.4. Engine Performance Tasks - Inspect, test, and service distributor.				X		X	X																										
VIII.C.5. Engine Performance Tasks - Inspect and test ignition system secondary circuit wiring and components; perform necessary action.				X		X	X																										
VIII.C.6. Engine Performance Tasks - Inspect and test ignition coil(s); perform necessary action.				X		X	X																										
VIII.C.7. Engine Performance Tasks - Check and adjust ignition system timing and timing advance/retard (where applicable).				X		X	X																										
VIII.C.8. Engine Performance Tasks - Inspect and test ignition system pick up sensor or triggering devices; perform necessary action.			X			X	X																										