

EASTERN ARIZONA COLLEGE

Vehicle Emission Strategies and Testing

Course Design
2017-2018

Course Information

Division Industrial Technology Education
Course Number AUT 265
Title Vehicle Emission Strategies and Testing
Credits 2
Developed by Brian Coppola
Lecture/Lab Ratio 1 Lecture/2 Lab

Transfer Status

ASU	NAU	UA
OMT Dept Elective	CTE Departmental Elective	Non Transferable

Activity Course No
CIP Code 47.0604
Assessment Mode Pre/Post Test (25 Questions/100 Points)
Semester Taught Upon Request
GE Category None
Separate Lab No
Awareness Course No
Intensive Writing Course No

Prerequisites

AUT 105 or instructor approval

Educational Value

This course is designed to reinforce and apply information, processes, and ideas gained in other courses. The major intent of this course is to enhance the individual's abilities to work with and diagnose concerns related to engine performance.

Description

This course provides instruction on diagnostic procedures for automotive emission failure concerns. Course includes an in-depth study in how modern fuel, ignition, and power train computer controlled systems relate to exhaust emission strategies. Course gives students an opportunity to use industry-standard testing equipment such as, hand-held scanners and infrared exhaust analyzers. This course requires the student to have basic skills and knowledge in electrical/electronic fundamentals and together with AUT 110, prepares the student for ASE certification test on engine performance.

Supplies

Safety glasses

Competencies and Performance Standards

1. Apply proper safety procedures and processes.

Learning objectives

What you will learn as you master the competency:

- a. Acquaint self with shop environment and hazards.
- b. Acquaint self with emergency procedures and policy.
- c. Accept responsibility for personal well-being and practice and follow safety guidelines.
- d. Acquaint self with material safety data sheets and chemicals used in shop.

Performance Standards

You will demonstrate your competence:

- o by completing safety assignments and written exam at a satisfactory level

Your performance will be successful when:

- o learner observes and practices safety procedures

2. Diagnose and repair various computerized engine hard code/fault concerns. (NATEF VIII B)

Learning objectives

What you will learn as you master the competency:

- a. Determine root cause of hard code failure.
- b. Test and repair components that caused hard code failure.

Performance Standards

You will demonstrate your competence:

- o by completing NATEF aligned assignment and job sheets listed in the related learning plan (The assignment and job sheets must be completed at a satisfactory level to the instructor).
- o by performing the priority NATEF tasks listed in the related learning plan (The tasks must be completed with limited supervision – entry level)

Your performance will be successful when:

- o learner is productive, works safely, and in a professional manner while working on the NATEF task requirements listed in related learning plan
- o learner provides acceptable oral and/or written responses to questions and/or situations asked by the instructor, while working on the NATEF task requirements listed in the learning plan
- o learner actively participates in the NATEF task requirements listed in the related learning plan
- o learner attends required class and lab sessions and shows up on time

3. Diagnose and repair various computerized power train intermittent system faults/concerns. (NATEF VIII A & D)

Learning objectives

What you will learn as you master the competency:

- a. Determine root cause of intermittent driveability concerns.
- b. Test and repair components to bring specific engine systems back into proper working order.

Performance Standards

You will demonstrate your competence:

- by completing NATEF aligned assignment and job sheets listed in the related learning plan (The assignment and job sheets must be completed at a satisfactory level to the instructor)
- by performing the priority NATEF tasks listed in the related learning plan (The tasks must be completed with limited supervision – entry level)

Your performance will be successful when:

- learner is productive, works safely, and in a professional manner while working on the NATEF task requirements listed in related learning plan
- learner provides acceptable oral and/or written responses to questions and/or situations asked by the instructor, while working on the NATEF task requirements listed in the learning plan
- learner actively participates in the NATEF task requirements listed in the related learning plan
- learner attends required class and lab sessions and shows up

4. Diagnose and repair excessive emission failures/concerns. (NATEF VIII A & E)

Learning objectives

What you will learn as you master the competency:

- a. Determine root cause for excessive emission emitting from the exhaust and evaporative emission system.
- b. Perform and interpret four or five gas baseline tests.
- c. Identify component causing emission failure and repair or replace.

Performance Standards

You will demonstrate your competence:

- by completing NATEF aligned assignment and job sheets listed in the related learning plan (The assignment and job sheets must be completed at a satisfactory level to the instructor)
- by performing the priority NATEF tasks listed in the related learning plan (The tasks must be completed with limited supervision – entry level)

Your performance will be successful when:

- learner is productive, works safely, and in a professional manner while working on the NATEF task requirements listed in related learning plan
- learner provides acceptable oral and/or written responses to questions and/or situations asked by the instructor, while working on the NATEF task requirements listed in the learning plan
- learner actively participates in the NATEF task requirements listed in the related learning plan
- learner attends required class and lab sessions and shows up

5. Demonstrate ability to utilize various diagnostic equipment, such as, hand-held scanners, scopes, DVOM, logic probes, sensor simulators, and an exhaust gas analyzer. (NATEF VI A, NATEF VIII B, D, & E)

Learning objectives

What you will learn as you master the competency:

- a. Perform strategy-based diagnostic process using scanner, scopes, DVOM, logic probe, sensor simulators, and exhaust analyzer.

Performance Standards

You will demonstrate your competence:

- by completing NATEF aligned assignment and job sheets listed in the related learning plan (The assignment and job sheets must be completed at a satisfactory level to the instructor)
- by performing the priority NATEF tasks listed in the related learning plan (The tasks must be completed with limited supervision – entry level)

Your performance will be successful when:

- learner is productive, works safely, and in a professional manner while working on the NATEF task requirements listed in related learning plan
- learner provides acceptable oral and/or written responses to questions and/or situations asked by the instructor, while working on the NATEF task requirements listed in the learning plan
- learner actively participates in the NATEF task requirements listed in the related learning plan
- learner attends required class and lab sessions and shows up

6. Demonstrate ability to utilize various repair material resources to help aid in identifying and fixing drivability concerns. (NATEF VIII B)

Learning objectives

What you will learn as you master the competency:

- a. Identify resources which can help isolate emission and driveability concerns.
- b. Interpret and follow diagnostic techniques/processes outlined in various repair informational resources.

Performance Standards

You will demonstrate your competence:

- by completing NATEF aligned assignment and job sheets listed in the related learning plan (The assignment and job sheets must be completed at a satisfactory level to the instructor)
- by performing the priority NATEF tasks listed in the related learning plan (The tasks must be completed with limited supervision – entry level)

Your performance will be successful when:

- learner is productive, works safely, and in a professional manner while working on the NATEF task requirements listed in related learning plan
- learner provides acceptable oral and/or written responses to questions and/or situations asked by the instructor, while working on the NATEF task requirements listed in the learning plan
- learner actively participates in the NATEF task requirements listed in the related learning plan
- learner attends required class and lab sessions and shows up

7. Demonstrate proper testing techniques and safety precautions when dealing with sensitive electronic components and circuits. (NATEF VIII B & E)

Learning objectives

What you will learn as you master the competency:

- a. Perform testing and repairs following manufacturer's recommended techniques and safety precaution.

Performance Standards

You will demonstrate your competence:

- o by completing NATEF aligned assignment and job sheets listed in the related learning plan (The assignment and job sheets must be completed at a satisfactory level to the instructor)
- o by performing the priority NATEF tasks listed in the related learning plan (The tasks must be completed with limited supervision – entry level)

Your performance will be successful when:

- o learner is productive, works safely, and in a professional manner while working on the NATEF task requirements listed in related learning plan
- o learner provides acceptable oral and/or written responses to questions and/or situations asked by the instructor, while working on the NATEF task requirements listed in the learning plan
- o learner actively participates in the NATEF task requirements listed in the related learning plan
- o learner attends required class and lab sessions and shows up

Types of Instruction

Classroom Presentation

Lab

Grading Information

Grading Rationale

Each instructor has the flexibility to develop evaluative procedures within the following parameters.

1. The Post Test will represent 10% of the course grade.
2. Course learning activities shall represent 90% of the course grade.

Grading Weights

Lab=50%

Class (Includes Test and Assignments and Final)=50%

Class score calculation-

Quizzes, assignments and job sheet points shall be added and carry a weight equal to one test score.

All exams except the final shall have equal weight (test scores averaged) and used in class score calculations.

The final (post test) will be worth at least 10% of the overall final grade calculation.

Lab score calculation-

Instructor should evaluate each student's work habits using lab time card.

Each student should be evaluated on productivity and progress on task requirements, working in a professional manner, clean-up and safe work habits. Instructor is also required to evaluate each student's skill level in achieving the NATEF task requirement outlined in the various learning plans.

Instructors are encouraged to reward students for showing up on time and attending each class and lab session. This can be done by requiring students to make arrangements with the instructor to make-up any lost time prior to missed day. All students need to notify the instructor of sick days through voice mail, etc. on the day of sickness. Instructors should not allow for any work to be turned in late or any test made up without some type of deduction for late assignments/test. Suggested deduction 50% of original score.

Grading Scale

A	90%-100%
B	80%-89%
C	70%-79%
D	60%-69%
F	Below 60%

Pass/Fail A non-major student may choose to have a grade of P or F rather than a letter grade. A grade of P will require that the student receive a percentage grade of at least 70%. A grade less than this will result in a grade of F.

Learning Plan

Safety

Overview

In this learning plan you will develop the knowledge needed to work safely in a shop environment. You will learn safety procedures, the location of safety equipment, and the safety features of various shop equipment. The instruction will cover general shop safety processes, fire safety, battery safety, lifting procedures, and health-related hazards.

1. Apply proper safety procedures and processes.

Learning Activities

- ____1. Complete a worksheet/assignment sheet.

- ____2. Collect a current article that relates to concepts and issues about which you are studying.

- ____3. Listen and observe a lecture covering safety procedures and practices - review a safety and hazards video.

- ____4. Operate hoist, floor jack (jack stands) and any equipment needed during assigned lab activities.

- ____5. Identify location of safety equipment, first-aid kit, phone, fire blanket, fire extinguishers, exits, light switches, and vents.

Assessment Activities

- ____1. Participate in safety discussion.
- ____2. Complete activities in lesson.
- ____3. Complete written safety test.

Learning Plan

Hard Core Concerns

Overview

To diagnose various hard code concerns.

2. Diagnose and repair various computerized engine hard code/fault concerns. (NATEF VIII B)

Learning Activities

- ____1. Interpret and verify concern and determine necessary action. (P-1 NATEF VIII A 1)

- ____2. Diagnose unusual exhaust color, odor, and sound and determine necessary action. (P-2 NATEF VIII A 4)

- ____3. Retrieve and record stored OBD I diagnostic trouble codes and clear codes. (P-1 NATEF VIII B 1)

- ____4. Retrieve and record stored OBD II diagnostic trouble codes and clear codes. (P-3 NATEF VIII B 2)

- ____5. Determine reason for emissions or driveability concerns resulting from failure of computerized engine controls with no stored diagnostic trouble codes and determine necessary action. (P-1 NATEF VIII B 4)

- ____6. Inspect and test computerized engine control system sensors, powertrain control module (PCM), actuators, and circuits and perform necessary action. (P-2 NATEF VIII B 5)

- ____7. Obtain and interpret digital multimeter (DMM) readings. (P-1 NATEF VIII B 6)

Assessment Activities

- ____1. Participate in classroom discussion of subject matter. Listen, take notes, and discuss items presented in class related to hard code diagnosis.

- ____2. Access and use repair information systems and interactive computer-based learning systems and reference material

- ____3. Complete all assignments and job sheets as required, hand-held scope job sheets, component ID, Code & manual worksheet, scan tool job sheets, five-gas reading article critique, five-gas analysis job sheet, fuel testing job sheet, strategy-based diagnosis work sheets, Ford computer-based instruction activities, ATEC board KOEO & KOER, and multi-meter job sheets.

- ____4. Complete written test covering lab scope & scan tool/ fault diagnosis.

Learning Plan

Intermittent Driveability Concerns

Overview

To diagnose various intermittent driveability concerns.

3. Diagnose and repair various computerized power train intermittent system faults/concerns. (NATEF VIII A & D)

Learning Activities

- ____ 1. Interpret and verify concern and determine necessary action. (P-1 NATEF VIII A 1)
- ____ 2. Diagnose unusual exhaust color, odor, and sound and determine necessary action. (P-2 NATEF VIII A 4)
- ____ 3. Retrieve and record stored OBD I diagnostic trouble codes and clear codes. (P-1 NATEF VIII B 1)
- ____ 4. Retrieve and record stored OBD II diagnostic trouble codes and clear codes. (P-3 NATEF VIII B 2)
- ____ 5. Determine reason for emissions or driveability concerns resulting from failure of computerized engine controls with no stored diagnostic trouble codes and determine necessary action. (P-1 NATEF VIII B 4)
- ____ 6. Inspect and test computerized engine control system sensors, powertrain control module (PCM), actuators, and circuits and perform necessary action. (P-2 NATEF VIII B 5)
- ____ 7. Obtain and interpret digital multi-meter (DMM) readings. (P-1 NATEF VIII B 6)
- ____ 8. Inspect and test power and ground circuits and connections and service or replace as needed. (P-1 NATEF VIII B 9)
- ____ 9. Determine reason for driveability and emissions problems resulting from failures of interrelated systems (cruise control, security alarms, suspension controls, traction controls, A/C, automatic transmissions, non-OEM-installed accessories, and similar systems). (P-2 NATEF VIII B 11)
- ____ 10. Check and adjust (where applicable) ignition system timing and timing advance/retard. (P-1 NATEF VIII C 7)
- ____ 11. Inspect and test ignition system pick-up sensor or triggering devices and perform necessary action. (P-2 NATEF VIII C 8)
- ____ 12. Determine cause of driveability problems resulting from failure of the positive crankcase ventilation (PCV) system. (P-1 NATEF VIII E 1-1)
- ____ 13. Determine reason for hot or cold no-starting, hard starting, poor driveability, incorrect idle speed, poor idle, flooding, hesitation, surging, engine misfire, power loss, stalling, poor mileage, dieseling, and emissions problems on vehicles with carburetor-type fuel systems. (P-3 NATEF VIII D 1)
- ____ 14. Determine reason for hot or cold no-starting, hard starting, poor driveability, incorrect idle speed, poor idle, flooding, hesitation, surging, engine misfire, power loss, stalling, poor mileage, dieseling, and emissions problems on vehicles with injector-type fuel systems. (P-3 NATEF VIII D 12)
- ____ 15. Check fuel for contaminants and quality and determine necessary action. (P-2 NATEF VIII D 4)
- ____ 16. Inspect and test fuel pressure regulation system and components of injection-type fuel systems and perform necessary action. (P-1 NATEF VIII D 7)
- ____ 17. Perform exhaust system back-pressure test and determine necessary action. (P-1 NATEF VIII D 16)

Assessment Activities

- _____ 1. Participate in classroom discussion of subject matter. Listen, take notes, and discuss material related to diagnosis of intermittent problems.
- _____ 2. Access and use repair information systems and interactive computer-based instruction modules - driveability diagnosis. Also, utilize reference material to complete related tasks.
- _____ 3. Complete activities related to intermittent fault diagnosis. Ford CBI - fuel & air no code trouble shooting, Ford CBI advance diagnosis no code, ATEC board data stream diagnosis, on vehicle fault diagnosis, Ford timing check & output state test & wiggle test, Chrysler switch test & ATM test.
- _____ 4. Complete related test covering required tests.

Learning Plan

Excessive Emission Concerns

Overview

To diagnose excessive emission concerns.

4. Diagnose and repair excessive emission failures / concerns. (NATEF VIII A & E)

Learning Activities

- ____ 1. Perform strategic-based diagnostic process to determine emission failure due to air injection and or catalytic converter system. (P2 NATEF VIII 3-1)
- ____ 2. Obtain and interpret digital multi-meter (DMM) readings. (P-1 NATEF VIII B 6)
- ____ 3. Determine reason for emissions and driveability problems caused by failure of the exhaust gas recirculation (EGR) system. (P-1 NATEF VIII E 2-1)
- ____ 4. Inspect and test electrical/electronic sensors, controls, and wiring of exhaust gas recirculation (EGR) systems. (P-2 NATEF VIII E 2-4)
- ____ 5. Determine reason for emissions and driveability problems resulting from failure of the intake air temperature control system. (P-3 NATEF VIII E 4-1)
- ____ 6. Determine reason for emissions and driveability problems resulting from failure of early fuel evaporation control system. (P-3 NATEF VIII E 5-1)
- ____ 7. Determine reason for emissions and driveability problems resulting from failure of evaporative emissions control system and determine necessary action. (P-2 NATEF VIII E 6-1)
- ____ 8. Determine reason for emission and driveability problems resulting from failure of air injection system and or catalytic converter. (P-1 NATEF VIII E 3-1)

Assessment Activities

- ____ 1. Participate in classroom discussion of subject matter. Listen, take notes, and discuss items presented in class related to vehicle emission failures/IM 240 drive trace.
- ____ 2. Access and use repair information systems and interactive computer-based instruction dealing with excessive exhaust emissions.
- ____ 3. Complete all required activities related to emission systems. Complete assignment sheets & job sheet related to five-gas analysis loaded and unloaded, assignments read five gas analyses, emission component ID and testing.
- ____ 4. Complete test related to vehicle emission ID and testing.

Learning Plan

Utilization of Diagnostic Equipment

Overview

To demonstrate ability to utilize various diagnostic equipment.

5. **Demonstrate ability to utilize various diagnostic equipment, such as, hand-held scanners, scopes, DVOM, logic probes, sensor simulator and exhaust gas analyzer. (NATEF VI A, NATEF VIII B, D, & E)**

Learning Activities

- ____ 1. Prepare four or five gas analyzer; inspect and prepare vehicle for test, and obtain exhaust readings, interpret readings, and determine necessary action. (P-1 NATEF VIII A 10)
- ____ 2. Check voltage and voltage drop in electrical/electronic circuits using a digital multi-meter (DMM) and determine necessary action. (P-1 NATEF VI A 3)
- ____ 3. Check current flow in electrical/electronic circuits and components using an ammeter and determine necessary action. (P-1 NATEF VI A 4)
- ____ 4. Check continuity and resistances in electrical/electronic circuits and components with an ohmmeter and determine necessary action. (P-1 NATEF VI A 5)

Assessment Activities

- ____ 1. Participate in discussion of subject matter. Participate in hands-on activities related to using hand-held testing equipment.
- ____ 2. Complete all required activities. Participate in hands-on activities related to using hand-held scan tool, lab scope, DVOM.

Learning Plan

Utilization of Repair Material Resources

Overview

To demonstrate an ability to utilize various repair material resources.

6. Demonstrate ability to utilize various repair material resources to help aid in identifying and fixing driveability concerns. (NATEF VIII B)

Learning Activities

- ____1. Access and use electronic service information (ESI). (P-3 NATEF VIII B 7)

- ____2. Access and use manual/paper resources. (P-3 NATEF VIII B 2)

- ____3. Locate and interpret vehicle and major component identification numbers (VIN< vehicle certification labels, and calibration decals). (P-1 NATEF VIII B 8)

Assessment Activities

- ____1. Utilized reference material while completing assignments and tests.

- ____2. Access and use paper and computerized reference material while performing vehicle repairs.

Learning Plan

Precautions in Dealing With Sensitive Electronic Components and Circuits

Overview

To demonstrate proper testing techniques and safety precautions when dealing with sensitive material.

- 7. Demonstrate proper testing techniques and safety precautions when dealing with sensitive electronic components and circuits. (NATEF VIII B & E)**

Learning Activities

- ____1. Practice recommended precautions when handling static sensitive devices. (P-2 NATEF VIII B 10)

Assessment Activities

- ____1. Follow manufacture safety requirements while performing vehicle repairs.