

EASTERN ARIZONA COLLEGE
Automotive Electronics and Computerized Vehicle Controls
Course Design
2017-2018

Course Information

Division Industrial Technology Education
Course Number AUT 220
Title Automotive Electronics and Computerized Vehicle Controls
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 Spring semester in odd-numbered years
GE Category None
Separate Lab No
Awareness Course No
Intensive Writing Course No

Prerequisite

AUT 105 and AUT 110 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 various vehicle computerized systems.

Description

This course provides a study of automotive power train computerized systems and addresses electronic principles. Course includes an in-depth study of computerized engine/power train control operation, trouble shooting techniques, and proper repair of these systems. This course requires each student have basic skills and knowledge in electrical/electronic fundamentals and prepares the student to take the ASE tests which have electrical/electronic or automotive computer control system questions.

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 computerized vehicle hard code failures, follow a strategy-based process and use various scan tool functions, wiring diagrams, DVOM and service information. (NATEF VIII A & B, NATEF VI A)

Learning objectives

What you will learn as you master the competency:

- a. Perform preliminary diagnosis process and interpret scan tool codes and PID data.
- b. Test mechanical condition of engine.
- c. Utilize service reference material to help isolate systems fault.

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 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 related 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 computerized vehicle with intermittent operational and/or emission related concerns by isolating system faults using a strategy-based process. (NATEF VIII A, B, C, D, & E, NATEF VI A)

Learning objectives

What you will learn as you master the competency:

- a. Perform preliminary diagnostic process and interpret scan tool data.
- b. Test mechanical condition of engine.
- c. Perform trouble-shooting techniques to test for proper operation of fuel, ignition, air induction, and emission systems.
- d. Utilize service reference material to help isolate system component failures.

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 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 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 related learner, attends required class and lab sessions and shows up on time

4. Perform repair on isolated computerized systems faults according to manufacture requirements.(NATEF VIII B, C, D, E, NATEF VI A)

Learning objectives

What you will learn as you master the competency:

- a. Demonstrate the ability to make proper repair to computerized system.
- b. Verify the repair solves the original concern.

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 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 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 related learning plan
- learner attends required class and lab sessions and shows up on time

Types of Instruction

Classroom Presentation

Lab

Individualized/Independent Study

Simulated or Actual Work Experience

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=45%

Class (Includes Test and Assignments and Final)=45%

Grading Methods

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%

P A non-major student may choose to have a grade of P/ F rather than a letter grade. A grade of P will require that the student receive a percentage grade of at least 68%. 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 Code Failures

Overview

To diagnose computerized vehicle hard code failures using a strategy-based process.

2. Diagnose computerized vehicle hard code failures using a strategy-based process. (NATEF VIII A & B, NATEF VI A)

Learning Activities

- ____ 1. Interpret and verify concern. (P-1 NATEF VIII A 1)
- ____ 2. Use wiring diagrams during diagnosis of electrical circuit problems. (P-1 NATEF VI A 1)
- ____ 3. Check electrical circuits with a test light and determine necessary action. (P-2 NATEF VI A 2)
- ____ 4. Check voltage and voltage drop in electrical/electronic circuits using a digital multimeter (DMM) and determine necessary action. (P-1 NATEF VI A 3)
- ____ 5. Check current flow in electrical/electronic circuits and components using an ammeter and determine necessary action. (P-1 NATEF VI A 4)
- ____ 6. Check continuity and resistances in electrical/electronic circuits and components with an ohmmeter and determine necessary action. (P-1 NATEF VI A 5)
- ____ 7. Check electrical circuits using jumper wires and determine necessary action. (P-2 NATEF VI A 6)
- ____ 8. Locate shorts, grounds, opens, and resistance problems in electrical/electronic circuits and determine necessary action. (P-1 NATEF VI A 7)
- ____ 9. Retrieve and record stored OBD I diagnostic trouble codes and clear codes. (P-1 NATEF VIII B 1)
- ____ 10. Retrieve and record stored OBD II diagnostic trouble codes and clear codes. (P-3 NATEF VI B 2)
- ____ 11. Locate and interpret vehicle and major component identification numbers (VIN, vehicle certification labels, and calibration decals). (P-1 NATEF VI B 8)

Assessment Activities

- ____ 1. Participate in discussion of subject matter. Watch Berwall A/V presentation, listen, take notes, complete Ford CBI vehicle fault related to lesson material.
- ____ 2. Complete lab job sheets. ID components, pull codes no scan tool & with scan tool, interpret scan data stream, locate and follow code chart, test components using DVOM, follow GM & Ford diagnostic process.
- ____ 3. Complete test covering common computerized engine system components & operational theory.

Learning Plan

Intermittent Operational and/or Emissions Concerns

Overview

To diagnose computerized vehicle with intermittent operational and/or emission related concerns.

3. Diagnose computerized vehicle with intermittent operational and/or emission related concerns by isolating system faults using a strategy-based process. (NATEF VIII A, B, C, D, & E, NATEF VI A)

Learning Activities

- ____ 1. Interpret and verify concern. (P-1 NATEF VIII A 1)
- ____ 2. Check for unusual exhaust color, odor, and sound and determine necessary action. (P-2 NATEF VIII A 4)
- ____ 3. Perform engine absolute (vacuum/boost) manifold pressure tests and determine necessary action. (P-1 NATEF VIII A 5)
- ____ 4. Perform cylinder power balance test and determine necessary action (gas only). (P-1 NATEF VIII A 6)
- ____ 5. Perform relative compression test and determine necessary action. (P-1 NATEF VIII A 7)
- ____ 6. Check for stored OBD I diagnostic trouble codes and clear codes. (P-1 NATEF VIII B 1)
- ____ 7. Check for record stored OBD II diagnostic trouble codes and clear codes. (P-3 NATEF VIII B 2)
- ____ 8. Inspect engine mechanical, electrical, electronic, fuel, and ignition concerns with an oscilloscope and engine diagnostic equipment and determine necessary action. (P-1 NATEF VIII A 9)
- ____ 9. Check and adjust (where applicable) ignition system timing and timing advance/retard. (P-1 NATEF VIII C 7)
- ____ 10. Inspect and test fuel pressure regulation system and components of injection-type fuel systems. (P-1 NATEF VIII D 7)
- ____ 11. Check idle speed. (P-2 NATEF VIII D 12)
- ____ 12. Inspect and test cold enrichment system and components. (P-3 NATEF VIII D 8)
- ____ 13. Inspect air induction system and components, and repair as needed
- ____ 14. Diagnose the causes of emissions or drivability concerns resulting from failure of computerized engine controls with stored diagnostic trouble codes. (P-1 NATEF VIII B 3)
- ____ 15. Diagnose emissions or drivability concerns resulting from failure of computerized engine controls with no stored diagnostic trouble codes and determine necessary action. (P-1 NATEF VIII B 4)
- ____ 16. Inspect and test computerized engine control system sensors, power train control module (PCM), actuators, and circuits and perform necessary action. (P-2 NATEF VIII B 5)
- ____ 17. Obtain and interpret digital multimeter (DMM) readings. (P-1 NATEF VIII B 6)
- ____ 18. Access and use electronic service information (ESI). (P-3 NATEF VIII B 7)
- ____ 19. Locate and interpret vehicle and major component identification numbers (VIN, vehicle certification labels, and calibration decals). (P-1 NATEF VIII B 8)
- ____ 20. Inspect and test power and ground circuits and connections and service or replace as needed. (P-1 NATEF VIII B 9)

- ____ 21. Practice recommended precautions when handling static sensitive devices. (P-2 NATEF VIII B 10)
- ____ 22. Diagnose no-starting, drivability, and emissions concerns on vehicles with electronic ignition (EI/DIS) (Distributorless) systems and determine necessary action. (P-1 NATEF VIII C 1)
- ____ 23. Diagnose hot or cold no-starting, hard starting, poor drivability, 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 and determine necessary action. (P-3 NATEF VIII D 1)
- ____ 24. Diagnose hot or cold no-starting, hard starting, poor drivability, incorrect idle speed, poor idle, flooding, hesitation, surging, engine misfire, power loss, stalling, poor mileage, dieseling, and emissions problems on vehicles with injection-type fuel systems and determine necessary action. (P-1 NATEF VIII D 2)
- ____ 25. Use wiring diagrams during diagnosis of electrical circuit problems. (P-1 NATEF VI A 1)
- ____ 26. Check voltage, voltage drop, current and resistance in electrical/electronic circuits using a digital multimeter (DMM). (P-1 NATEF VI A 3)

Assessment Activities

- ____ 1. Participate in discussion of subject matter. View Cardon or NAPA A/V material covering intermittent fault diagnosis, View OTC / Snap-On advance scan tool diagnosis A/V material, listen, take notes and complete Ford CBI activities.
- ____ 2. Complete job sheets related to lesson material. Scan tool Snap shot / movie, follow Ford or GM diagnostic process, test computerized system controls using symptoms, test isolated components using DVOM and scan tool wiggle test, switch tests, ATM tests, KOEO & KOER, utilized reference material to isolate circuit problems and follow systems / diagnostic circuit tests.
- ____ 3. Complete tests covering GM, Chrysler, Ford, import computerized systems - should include OBD I & OBD II.

Learning Plan

Isolated Computerized Systems Faults

Overview

To perform repairs on isolated computerized systems faults.

4. Perform repair on isolated computerized systems faults. (NATEF VIII B, C, D, E, NATEF VI A)

Learning Activities

- ____ 1. Repair wiring harnesses and connectors. (P-1 NATEF VI A 11)
- ____ 2. Repair or replace electrical/electronic sensors, controls, and wiring of exhaust gas recirculation (EGR) systems and perform necessary action. (P-2 NATEF VIII E 2-4)
- ____ 3. Repair or replace components of intake air temperature control system. (P-3 NATEF VIII E 4-2)
- ____ 4. Repair or replace fuel pressure regulation system and components of injection-type fuel systems and perform necessary action. (P-1 NATEF VIII D 7)
- ____ 5. Repair or adjust idle speed and fuel mixture. (P-3 NATEF VIII D 13)
- ____ 6. Repair or replace computerized engine control system sensors, power train control module (PCM), actuators, and circuits and perform necessary action. (P-2 NATEF VIII B 5)
- ____ 7. Repair power and ground circuits and connections and service or replace as needed. (P-1 NATEF VIII B 9)
- ____ 8. Practice recommended precautions when handling static sensitive devices. (P-2 NATEF VIII B 10)
- ____ 9. Repair or replace ignition primary circuit wiring and components and perform necessary action. (P-2 NATEF VIII C 3)
- ____ 10. Repair or replace ignition system secondary circuit wiring and components and perform necessary action. (P-2 NATEF VIII C 5)
- ____ 11. Adjust (where applicable) ignition system timing and timing advance/retard. (P-1 NATEF VIII C 7)
- ____ 12. Repair ignition system pick-up sensor or triggering devices. (P-2 NATEF VIII C 8)
- ____ 13. Access and utilize electronic service and repair information (ESI). (P3 NATEF VIII B 7)

Assessment Activities

- ____ 1. Participate in discussion of subject matter. Complete ATEC board KOEO & KOER, listen, take notes, and discuss material related to lessons.
- ____ 2. Complete job sheets related testing computerized system components using DVOM, scan tool advance functions and hand-held scope.
- ____ 3. Complete hands-on testing sequence and system bugs process.