

Course Outline of Record

1. Course Code: AUTO-040E
2.
 - a. Long Course Title: CNG Diagnosis & Repair
 - b. Short Course Title: CNG DIAG & REPAIR
3.
 - a. Catalog Course Description:
 This course provides classroom lecture/discussion and hands-on training on CNG diagnosis and repair. The course is designed to introduce the service technician to safety, diagnostic and repair practices and procedures unique to gaseous fuel vehicles including: ignition, fuel delivery and emissions systems design, operation, diagnosis and service.
 - b. Class Schedule Course Description:
 This course provides classroom lecture/discussion and hands-on training on CNG diagnosis and repair. The course is designed to introduce the service technician to safety, diagnostic and repair practices and procedures unique to gaseous fuel vehicles including: ignition, fuel delivery and emissions systems design, operation, diagnosis and service.
 - c. Semester Cycle (if applicable): *N/A*
 - d. Name of Approved Program(s):
 - ADVANCED TRANSPORTATION TECHNOLOGIES AS Degree for Employment Preparation
4. Total Units: 4.00 Total Semester Hrs: 108.00
 Lecture Units: 3 Semester Lecture Hrs: 54.00
 Lab Units: 1 Semester Lab Hrs: 54.00
 Class Size Maximum: 21 Allow Audit: Yes
 Repeatability No Repeats Allowed
 Justification 0
5. Prerequisite or Corequisite Courses or Advisories:
Course with requisite(s) and/or advisory is required to complete Content Review Matrix (CCForm I-A)
N/A
6. Textbooks, Required Reading or Software: *(List in APA or MLA format.) N/A*
7. Entrance Skills: *Before entering the course students must be able:*

8. Course Content and Scope:

Lecture:

1. Compressed Natural Gas (CNG) safety precautions & procedures
2. Review of gaseous fuels fundamentals
3. Compressed Natural Gas (CNG) ignition systems component function and location
4. Compressed Natural Gas (CNG) fuel systems component function and location
5. Compressed Natural Gas (CNG) emissions systems component function and location
6. Compressed Natural Gas (CNG) diagnosis with current generation scan tool
7. Compressed Natural Gas (CNG) repair procedures

Lab: *(if the "Lab Hours" is greater than zero this is required)*

1. Practice CNG safety precautions & procedures
2. Diagnose, troubleshoot and repair CNG ignition system malfunctions
3. Diagnose, troubleshoot and repair CNG fuel system malfunctions
4. Diagnose, troubleshoot and repair CNG emissions system malfunctions
5. Diagnose, troubleshoot and repair CNG systems using current generation scan tool

9. Course Student Learning Outcomes:

- 1.

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After successfully completing this course the student should be able to pass Automotive Service Excellence (ASE) Transit Bus Compressed Natural Gas Engines (H1) or Light Vehicle Compressed Natural Gas (F1) certification exams.

10. Course Objectives: *Upon completion of this course, students will be able to:*

- a. Interpret and verify complaints; determine needed repairs.
- b. Diagnose and repair no starting, hard starting, engine misfire, poor driveability, power loss, poor mileage, and emissions problems on vehicle's Original Equipment Manufacturers (OEM) and supplemental sensors (e.g., manifold skin temperature, intake air temperature, etc.).
- c. Diagnose and repair intermittent or complete failure of electric, electronic or mechanical devices (e.g., hour meters, fuel level indicators, fuel selection devices).
- d. Check all fuel system components to include fuel lock-off, valves, solenoids, manual shutoff, connections, fittings, hoses and tubing for leaks, wear, installation and proper operation; repair or replace as needed.
- e. Diagnose the cause of abnormal fuel flow through fuel carrying components.
- f. Diagnose the cause of fuel odor or fuel loss by inspecting or testing the fuel supply system components such as valves, fuel supply container, pressure relief device (PRD), tubing and hoses; repair or replace as needed.
- g. Diagnose hot or cold no-starting, hard starting, poor driveability, incorrect idle speed, poor idle, flooding, hesitation, surging, engine misfire, power loss, stalling, poor mileage, and lean or rich mixture problems on vehicles with fumigation or injection type fuel systems; determine needed repairs.
- h. Inspect and test vacuum and electrical components and connections of fuel system; repair or replace as needed.
- i. Comply with shop and vehicle safety practices relevant to electric, hybrid and fuel cell vehicles.
- j. Perform diagnostic procedures on vehicles with on-board computer/electronic fuel system support.
- k. Follow manufacturer's maintenance schedule to ensure fluids and lubricants are at proper levels and serviced with recommended products.
- l. Identify the process of recertification or replacement of fuel supply container(s) according to most current regulations (e.g., Natural Gas Vehicle Standard 2 [NGV-2], Department of Transportation [DOT]); complete documentation; remove and replace fuel supply container, if required.
- m. Inspect fuel supply container(s) and brackets as it relates to certification: data plate, working pressures, fuel supply container damage, valves, bolts, torque specifications, and all sealing and venting equipment.
- n. Inspect air filters and fuel filter; service or replace as needed.
- o. Inspect, adjust, and test manual shut-off valve, service valve, check-valves, and solenoid valves; repair or replace as needed.
- p. Empty fuel supply container according to manufacturer's procedures and all local, state and federal regulations. (Local procedures will vary and extreme care must be exercised if using actual fuel. Use of inert gas is recommended for this task.)
- q. Inspect and test fuel selection system components; repair or replace as needed.
- r. Select and install swage, compression, flare, captive O-ring, National Pipe Thread (NPT), and other fittings using manufacturer's recommended sealants when required.
- s. Interpret and verify complaint; determine needed repairs.
- t. Inspect and test fuel pressure regulation system components; adjust, repair or replace as needed.
- u. Perform safe fueling procedures and determine fuel level.
- v. Identify working pressures and demonstrate an understanding of fuel characteristics as they relate to temperature and fill procedures.

11. Methods of Instruction: *(Integration: Elements should validate parallel course outline elements)*

- a. Collaborative/Team
- b. Demonstration, Repetition/Practice
- c. Discussion
- d. Lecture
- e. Observation
- f. Technology-based instruction

Other Methods:

Reading assignments

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12. Assignments: *(List samples of specific activities/assignments students are expected to complete both in and outside of class.)*

In Class Hours: 108.00

Outside Class Hours: 108.00

a. In-class Assignments

1. Lecture notes
2. Problem solving participation and discussion
3. Hands on activities

b. Out-of-class Assignments

1. Readings from required text: 1-3 chapters per week from both classroom and shop manuals.
2. Homework from required text: multiple-choice questions, fill in the blank and essay questions to be graded each week.
3. Completion of 3 SP2 safety tests.
4. Assigned readings and written summaries from selected instructor handouts.
5. Written summaries and analysis of assigned websites.
6. Must complete a course project consisting an essay describing, analyzing and summarizing a selected topic, including out of class research and fieldwork.
7. Students must keep a notebook of all course materials including homework, class notes, handouts, class project and team activities.
8. Vehicle diagnosis, troubleshooting and repair of personal, shop and other vehicles to be evaluated by the instructor during lab time.
9. Hands-on lab worksheets matching each course objective.
10. Must develop teamwork skills through lab activities and assigned special projects.

13. Methods of Evaluating Student Progress: *The student will demonstrate proficiency by:*

- College level or pre-collegiate essays
- Written homework
- Reading reports
- Laboratory projects
- Group activity participation/observation
- True/false/multiple choice examinations
- Mid-term and final evaluations
- Student participation/contribution
- Student preparation

14. Methods of Evaluating: Additional Assessment Information:

Review of homework Lab activity evaluations Written and hands-on exams

15. Need/Purpose/Rationale -- *All courses must meet one or more CCC missions.*

PO - Career and Technical Education

Fulfill the requirements for an entry- level position in their field.

Apply critical thinking skills to execute daily duties in their area of employment.

Display the skills and aptitude necessary to pass certification exams in their field.

Exhibit effective written, oral communication and interpersonal skills.

Transfer to a higher level learning institution

PO-BS Problem Solving

Recognize the importance of checking a proposed solution to verify that it satisfies the requirements of a problem.

IO - Critical Thinking and Communication

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Apply principles of logic to problem solve and reason with a fair and open mind.

16. Comparable Transfer Course

University System	Campus	Course Number	Course Title	Catalog Year
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17. Special Materials and/or Equipment Required of Students:

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| 1. Safety glasses meeting ANSI Z87.1
2. Three ring binder |
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18. Materials Fees: Required Material?

Material or Item	Cost Per Unit	Total Cost
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19. Provide Reasons for the Substantial Modifications or New Course:

Required due to changes in certification. Not a new course, but a major modification of the existing course.

20. a. Cross-Listed Course (Enter Course Code): N/A
b. Replacement Course (Enter original Course Code): AUTO-040D

21. Grading Method (choose one): Letter Grade Only

22. MIS Course Data Elements

- a. Course Control Number [CB00]: N/A
b. T.O.P. Code [CB03]: 94840.00 - Alternative Fuels and Adv
c. Credit Status [CB04]: D - Credit - Degree Applicable
d. Course Transfer Status [CB05]: C = Non-Transferable
e. Basic Skills Status [CB08]: 2N = Not basic skills course
f. Vocational Status [CB09]: Clearly Occupational
g. Course Classification [CB11]: Y - Credit Course
h. Special Class Status [CB13]: N - Not Special
i. Course CAN Code [CB14]: N/A
j. Course Prior to College Level [CB21]: Y = Not Applicable
k. Course Noncredit Category [CB22]: Y - Not Applicable
l. Funding Agency Category [CB23]: Y = Not Applicable
m. Program Status [CB24]: 1 = Program Applicable

Name of Approved Program (if program-applicable): ADVANCED TRANSPORTATION TECHNOLOGIES

Attach listings of Degree and/or Certificate Programs showing this course as a required or a restricted elective.)

23. Enrollment - Estimate Enrollment

First Year: 21
Third Year: 21

24. Resources - Faculty - Discipline and Other Qualifications:

- a. Sufficient Faculty Resources: Yes
b. If No, list number of FTE needed to offer this course: N/A

25. Additional Equipment and/or Supplies Needed and Source of Funding.

N/A

26. Additional Construction or Modification of Existing Classroom Space Needed. (Explain:)

N/A

27. FOR NEW OR SUBSTANTIALLY MODIFIED COURSES

Library and/or Learning Resources Present in the Collection are Sufficient to Meet the Need of the Students Enrolled in the

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Course: Yes

28. Originator Douglas Hugh Redman

Origination Date 06/27/17
