

JEFFERSON COLLEGE
COURSE SYLLABUS

AUT211
ADVANCED ENGINE PERFORMANCE

2 Credit Hours

Prepared by: Gary Boyher
Date: February 10, 2014

Revised by: Brad Berrey
Date: September, 26 2016

Chris DeGeare, M.Ed., Division Chair, Business and Technical Education
Dena McCaffrey, Ed.D., Dean, Career & Technical Education

AUT211 Advanced Engine Performance

I. CATALOGUE DESCRIPTION

- A. Pre-requisite: AUT201 Basic Electrical/Electronic Systems with a Grade of “C” or Better
 AUT202 Basic Electrical/Electronic Systems Lab with a Grade of “C” or Better
 Reading Proficiency
 Co-requisite: AUT212 Advanced Engine Performance Lab
- B. 2 Credit Hours
- C. This course covers combustion theory and chemistry. The course will explain different types of fuel delivery systems, their components, theory, and operation. This course also covers emission control systems, why they are necessary, and how they are integrated into modern automobiles. This course also includes scan tools, lab scopes and their uses. Also included are computer systems, OBD I, OBD II, data lines, and network communications. Completion of this course will prepare the student for employment in the automotive field and take the National Institute for Automotive Service Excellence (ASE) Electrical/Electronic Systems Test (A6), Engine Performance Test (A8), and Advanced Engine Performance Specialist Certification Test (L1). (F)

II. EXPECTED LEARNING OUTCOMES/CORRESPONDING ASSESSMENT MEASURES

A. General Engine Diagnosis		
Demonstrate understanding of how to complete a work order to include customer information, vehicle identifying information, customer concern, related service history, cause, and correction	P-1	Classroom Discussions Lectures Classroom Exercises Reading Assignments Written Tests
Demonstrate understanding of how to identify and interpret engine performance concern; determine necessary action	P-1	Classroom Discussions Lectures Classroom Exercises Reading Assignments Written Tests
Demonstrate understanding of researching applicable vehicle and service information, such as engine management system operation, vehicle service history, service precautions, and technical service bulletins	P-1	Classroom Discussions Lectures Classroom Exercises Reading Assignments Written Tests

Demonstrate how to Diagnose abnormal engine noises or vibration concerns; determine necessary action.	P-3	Classroom Discussions Lectures Classroom Exercises Reading Assignments Written Tests
Demonstrate understanding of excessive oil consumption coolant consumption, unusual exhaust color, odor, and sound; determine necessary action.	P-2	Classroom Discussions Lectures Classroom Exercises Reading Assignments Written Tests
Demonstrate understanding of locating and interpreting vehicle and major component identification numbers	P-1	Classroom Discussions Lectures Classroom Exercises Reading Assignments Written Tests
Demonstrate understanding of diagnosing abnormal exhaust color, odor, and sound; determine necessary action	P-2	Classroom Discussions Lectures Classroom Exercises Reading Assignments Written Tests
Demonstrate understanding of performing engine absolute (vacuum/boost) manifold pressure tests; determine necessary action	P-1	Classroom Discussions Lectures Classroom Exercises Reading Assignments Written Tests
Demonstrate understanding of performing cylinder power balance test; determine necessary action	P-2	Classroom Discussions Lectures Classroom Exercises Reading Assignments Written Tests
Demonstrate understanding of performing cylinder cranking and running compression tests; determine necessary action	P-1	Classroom Discussions Lectures Classroom Exercises Reading Assignments Written Tests
Demonstrate understanding of diagnosing engine mechanical, electrical, electronic, fuel, and ignition concerns; determine necessary action	P-1	Classroom Discussions Lectures Classroom Exercises Reading Assignments Written Tests

Demonstrate understanding cylinder leakage test; determine necessary action.	P-2	Classroom Discussions Lectures Classroom Exercises Reading Assignments Written Tests
Demonstrate understanding of preparing a 4 or 5 gas analyzer; inspect and prepare vehicle for test, and obtain exhaust readings; interpret readings, and determine necessary action	P-3	Classroom Discussions Lectures Classroom Exercises Reading Assignments Written Tests
Demonstrate understanding correct camshaft timing.	P-1	Classroom Discussions Lectures Classroom Exercises Reading Assignments Written Tests
Demonstrate understanding of verifying engine operating temperature; determine necessary action	P-1	Classroom Discussions Lectures Classroom Exercises Reading Assignments Written Tests

B. Computerized Engine Controls Diagnosis and Repair

Demonstrate understanding of retrieving and recording diagnostic trouble codes, OBD monitor status, and freeze frame data; clear codes when applicable	P-1	Classroom Discussions Lectures Classroom Exercises Reading Assignments Written Tests
Demonstrate understanding of diagnosing the causes of emissions or drivability concerns with stored or active diagnostic trouble codes; obtain, graph, and interpret scan tool data	P-1	Classroom Discussions Lectures Classroom Exercises Reading Assignments Written Tests
Demonstrate understanding of diagnosing emissions or drivability concerns without stored diagnostic trouble codes; determine necessary action	P-1	Classroom Discussions Lectures Classroom Exercises Reading Assignments Written Tests
Demonstrate understanding of checking for module communication (including CAN/BUS systems) errors using a scan tool	P-2	Classroom Discussions Lectures Classroom Exercises Reading Assignments Written Tests

Demonstrate understanding of inspecting and testing computerized engine control system sensors, powertrain/engine control module (PCM/ECM), actuators, and circuits using a scan tool, graphing multimeter (GMM)/digital storage oscilloscope (DSO); perform necessary action	P-1	Classroom Discussions Lectures Classroom Exercises Reading Assignments Written Tests
Demonstrate understanding of accessing and using service information to perform step-by-step diagnosis	P-1	Classroom Discussions Lectures Classroom Exercises Reading Assignments Written Tests
Demonstrate understanding of diagnosing drivability and emissions problems resulting from malfunctions of interrelated systems (cruise control, security alarms, suspension controls, traction controls, A/C, automatic transmissions, non-OEM-installed accessories, or similar systems); determine necessary action	P-3	Classroom Discussions Lectures Classroom Exercises Reading Assignments Written Tests
Demonstrate understanding of performing active tests of actuators using a scan tool; determine necessary action	P-1	Classroom Discussions Lectures Classroom Exercises Reading Assignments Written Tests
Demonstrate understanding of the importance of running all OBDII monitors for repair verification	P-1	Classroom Discussions Lectures Classroom Exercises Reading Assignments Written Tests

C. Ignition System Diagnosis and Repair

Demonstrate understanding of diagnosing ignition system related problems such as no-starting, hard starting, engine misfire, poor drivability, spark knock, power loss, poor mileage, and emissions concerns; determine necessary action	P-1	Classroom Discussions Lectures Classroom Exercises Reading Assignments Written Tests
Demonstrate understanding of inspecting and testing ignition primary and secondary circuit wiring and solid state components; test ignition coil(s); perform necessary action	P-1	Classroom Discussions Lectures Classroom Exercises Reading Assignments Written Tests

Demonstrate understanding of inspecting and testing crankshaft and camshaft position sensor(s); perform necessary action	P-1	Classroom Discussions Lectures Classroom Exercises Reading Assignments Written Tests
Demonstrate understanding of inspecting, testing, and/or replacing ignition control module, powertrain/engine control module; reprogram as necessary	P-2	Classroom Discussions Lectures Classroom Exercises Reading Assignments Written Tests

D. Fuel, Air Induction, and Exhaust Systems Diagnosis and Repair		
Demonstrate understanding of diagnosing 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; determine necessary action	P-1	Classroom Discussions Lectures Classroom Exercises Reading Assignments Written Tests
Demonstrate understanding of checking fuel for contaminants and quality; determine necessary action	P-2	Classroom Discussions Lectures Classroom Exercises Reading Assignments Written Tests
Demonstrate understanding of inspecting and testing fuel pumps and pump control systems for pressure, regulation, and volume; perform necessary action	P-1	Classroom Discussions Lectures Classroom Exercises Reading Assignments Written Tests
Demonstrate understanding of replace fuel filters	P-2	Classroom Discussions Lectures Classroom Exercises Reading Assignments Written Tests
Demonstrate understanding of inspecting throttle body, air induction system, intake manifold and gaskets for vacuum leaks and/or unmetered air	P-2	Classroom Discussions Lectures Classroom Exercises Reading Assignments Written Tests
Demonstrate understanding of inspect and test fuel injectors	P-1	Classroom Discussions Lectures Classroom Exercises Reading Assignments Written Tests

Demonstrate understanding of verifying idle control operation	P-1	Classroom Discussions Lectures Classroom Exercises Reading Assignments Written Tests
Demonstrate understanding of performing exhaust system back-pressure test; determine necessary action	P-1	Classroom Discussions Lectures Classroom Exercises Reading Assignments Written Tests
Demonstrate understanding of testing the operation of turbocharger/supercharger systems; determine necessary action	P-3	Classroom Discussions Lectures Classroom Exercises Reading Assignments Written Tests
Demonstrate understanding exhaust system back-pressure test; determine necessary action.	P-2	Classroom Discussions Lectures Classroom Exercises Reading Assignments Written Tests
Demonstrate understanding condition of exhaust system hangers, brackets, clamps, and heat shields; repair or replace as needed.	P-2	Classroom Discussions Lectures Classroom Exercises Reading Assignments Written Tests

E. Emissions Control Systems Diagnosis and Repair

Demonstrate understanding of diagnosing oil leaks, emissions, and drivability concerns caused by the positive crankcase ventilation (PCV) system; determine necessary action	P-2	Classroom Discussions Lectures Classroom Exercises Reading Assignments Written Tests
Demonstrate understanding of inspecting, testing and servicing positive crankcase ventilation (PCV) filter/breather cap, valve, tubes, orifices, and hoses; perform necessary action	P-2	Classroom Discussions Lectures Classroom Exercises Reading Assignments Written Tests

Demonstrate understanding of diagnosing emissions and drivability concerns caused by the exhaust gas recirculation (EGR) system; determine necessary action	P-1	Classroom Discussions Lectures Classroom Exercises Reading Assignments Written Tests
Demonstrate understanding of inspecting, testing, servicing, and replacing components of the EGR system, including EGR tubing, exhaust passages, vacuum/pressure controls, filters and hoses; perform necessary action	P-1	Classroom Discussions Lectures Classroom Exercises Reading Assignments Written Tests
Demonstrate understanding of inspecting and testing electrical/electronic sensors, controls, and wiring of exhaust gas recirculation (EGR) systems; perform necessary action	P-2	Classroom Discussions Lectures Classroom Exercises Reading Assignments Written Tests
Demonstrate understanding of diagnosing emissions and drivability concerns caused by the secondary air injection and catalytic converter systems; determine necessary action	P-2	Classroom Discussions Lectures Classroom Exercises Reading Assignments Written Tests
Demonstrate understanding of inspecting and testing mechanical components of secondary air injection systems; perform necessary action	P-3	Classroom Discussions Lectures Classroom Exercises Reading Assignments Written Tests
Demonstrate understanding of inspecting and testing electrical/electronically-operated components and circuits of air injection systems; perform necessary action	P-3	Classroom Discussions Lectures Classroom Exercises Reading Assignments Written Tests
Demonstrate understanding of inspecting and testing catalytic converter efficiency	P-1	Classroom Discussions Lectures Classroom Exercises Reading Assignments Written Tests
Demonstrate understanding of diagnosing emissions and drivability concerns caused by the evaporative emissions control system; determine necessary action	P-1	Classroom Discussions Lectures Classroom Exercises Reading Assignments Written Tests
Demonstrate understanding of inspecting and testing components and hoses of the evaporative emissions control system; perform necessary action	P-1	Classroom Discussions Lectures Classroom Exercises Reading Assignments Written Tests

Demonstrate understanding of interpreting diagnostic trouble codes (DTCs) and scan tool data related to the emissions control systems; determine necessary action	P-1	Classroom Discussions Lectures Classroom Exercises Reading Assignments Written Tests
---	-----	--

F. Engine Related Service

Demonstrate understanding of mechanical/electrical fans and fan control devices	P-1	Classroom Discussions Lectures Classroom Exercises Reading Assignments Written Tests
Demonstrate understanding cooling system pressure tests and dye tests to identify leaks; check coolant condition and level: inspect and test radiator, pressure cap, coolant recovery tank, and heater core and galley plugs; determine necessary action	P-1	Classroom Discussions Lectures Classroom Exercises Reading Assignments Written Tests
Demonstrate understanding causes of engine overheating	P-1	Classroom Discussions Lectures Classroom Exercises Reading Assignments Written Tests
Demonstrate understanding Inspect, replace, and adjust drive belts, tensioners, and pulleys; check pulley and belt alignment	P-1	Classroom Discussions Lectures Classroom Exercises Reading Assignments Written Tests
Demonstrate understanding Inspect and test coolant; drain and recover coolant; flush and refill cooling system with recommended coolant; bleed air as required	P-1	Classroom Discussions Lectures Classroom Exercises Reading Assignments Written Tests
Demonstrate understanding Inspect, test, and replace oil temperature and pressure switches and sensors	P-2	Classroom Discussions Lectures Classroom Exercises Reading Assignments Written Tests
Demonstrate understanding of identifying hybrid vehicle internal combustion engine service precautions	P-3	Classroom Discussions Lectures Classroom Exercises Reading Assignments Written Tests

III. OUTLINE OF TOPICS

- A. Properly Fill Out a Work Order
- B. Computerized Engine Controls Diagnosis and Repair
 - 1. Describe performing diagnostic procedures on vehicles
 - 2. Explain using information systems and processes to diagnose vehicles
 - 3. Describe using proper tools and equipment to diagnose vehicles
- C. Ignition System Diagnosis and Repair
 - 1. Describe ignition system related drivability problems
 - 2. Describe inspecting and testing ignition primary and secondary circuits and components
- D. Fuel, Air Induction, and Exhaust Systems Diagnosis and Repair
 - 1. Explain drivability problems related to fuel, air induction, or exhaust systems
 - 2. Describe testing for common fuel related drivability problems
 - 3. Discuss inspecting and testing of fuel systems components
- E. Emissions Control Systems Diagnosis and Repair
 - 1. Describe testing and inspecting emission control components
 - 2. Discuss common emission control failures and their causes
 - 3. Describe replacing defective components in the emission control system
- F. Engine Related Service
 - 1. Describe inspecting mechanical/electrical fans and fan control devices
 - 2. Describe identifying hybrid vehicle service precautions

IV. METHOD(S) OF INSTRUCTION

- A. Lecture
- B. Classroom Exercises
- C. Electude/Argo Online Curriculum
- D. Classroom Discussion

V. REQUIRED TEXTBOOK(S)

Al Santini, *Automotive Electricity & Electronics*, (Current Edition), Delmar

VI. REQUIRED MATERIALS

- A. Jefferson College Automotive Technology or Approved Sponsoring Shop Work Shirt
- B. Safety Glasses
- C. Work Boots

VII. SUPPLEMENTAL REFERENCES

None

VIII. METHODS OF EVALUATION

- A. Tests 33 1/3%
- B. Student Participation 33 1/3%
- C. Class Assignments 33 1/3%

IX. ADA AA STATEMENT

Any student requiring special accommodations should inform the instructor and the Coordinator of Disability Support Services (Technology Center 101; phone 636-481-3169).

X. ACADEMIC HONESTY STATEMENT

All students are responsible for complying with campus policies as stated in the Student Handbook (see College Website <http://www.jeffco.edu>).

XI. ATTENDANCE STATEMENT

Regular and punctual attendance is expected of all students. Any one of these four options may result in the student being removed from the class and an administrative withdrawal being processed: (1) Student fails to begin class; (2) Student ceases participation for at least two consecutive weeks; (3) Student misses 15 percent or more of the coursework; and/or (4) Student misses 15 percent or more of the course as defined by the instructor. Students earn their financial aid by regularly attending and actively participating in their coursework. If a student does not actively participate, he/she may have to return financial aid funds. Consult the College Catalog or a Student Financial Services representative for more details.

XII. OUTSIDE OF CLASS ACADEMICALLY RELATED ACTIVITIES

The U.S. Department of Education mandates that students be made aware of expectations regarding coursework to be completed outside the classroom. Students are expected to spend substantial time outside of class meetings engaging in academically related activities such as reading, studying, and completing assignments. Specifically, time spent on academically related activities outside of class combined with time spent in class meetings is expected to be a minimum of 37.5 hours over the duration of the term for each credit hour.