Laboratory Contact Hours: 48-54; Homework Hours: 0; Total Student Learning Hours: 48-54

CUYAMACA COLLEGE
COURSE OUTLINE OF RECORD

AUTOMOTIVE TECHNOLOGY 283L – ADVANCED ENGINE PERFORMANCE LABORATORY

3 hours laboratory, 1 unit

Catalog Description
This laboratory course describes and demonstrates proper inspection and diagnostic techniques for various advanced engine performance symptoms and conditions, including intermittent problems affecting ignition and fuel systems operations. This course is the laboratory practice opportunity for students taking courses AUTO 283 Advanced Engine Performance lecture, AUTO 283T Advanced Engine Performance Assessment Test Out, and/or for students taking a Work Experience course and need additional instruction and practice completing required ASE competencies.

Prerequisite
"C" grade or higher or "Pass" or the equivalent in: AUTO 162T Electronics Diagnosis and Repair Assessment Test Out, and 181T Engine Performance I Ignition and Fuel Systems Assessment Test Out, and 183T Engine Performance II Intake Exhaust Emission Systems Assessment Test Out.

Entrance Skills
1) Demonstrate computer input and output tests and activation using a scan tool
2) Obtain and describe normal and abnormal waveforms using a lab-scope
3) Test thermistor, potentiometer, variable reluctance, pressure, Hall-effect and related sensors
4) Graph and interpret system data using PIDS on a scan tool
5) Diagnose and repair computer communication networking faults
6) Describe types and functions of computer memory including RAM, ROM, and PROM
7) Demonstrate proper diagnosis and repair of electronic system concerns
8) Describe the operation of various engine performance sensors and actuators of intake and fuel systems
9) Use a scan tool to select PIDs and create a map display of normal engine system operation
10) Demonstrate knowledge of various ignition systems including waste spark, coil on plug, and driver on plug systems
11) Describe various types of fuel systems including throttle body injection, multiport injection, and direct fuel injection
12) Diagnose fuel and ignition related concerns using the work shop manual, and by performing systems tests
13) Describe various sensor inputs and actuators of ignition and fuel systems
14) Use system tests to differentiate between mechanical and engine performance concerns
15) Describe the operation of various engine performance sensors and actuators of intake and exhaust related systems
16) Use a scan tool to select PIDs and create a map display of engine system related to the operation of air intake and exhaust emissions
17) Demonstrate knowledge of various intake systems including variable intake, naturally aspirated, and forced air induction
18) Describe various types of exhaust system components including catalytic converters, exhaust manifolds, secondary air, and the sensors used to monitor oxygen and pressure
19) Diagnose emission concerns of exhaust gas recirculation, positive crankcase ventilation, intake, air, and evaporative fuel controls
20) Use system tests to determine normal and abnormal air and exhaust systems operations
21) Identify incomplete and complete system monitors

22) Identify freeze frame data

Course Content

1) Lab:
   a. Introduction and safety
   b. High pressure fuel rail systems
   c. Engine turbo pressure monitoring
   d. Low pressure fuel system effects on high pressure
   e. Heated wide band oxygen sensors (HEGO)
   f. Sensor PID mapping of manifold absolute pressure sensors
   g. Injector service and replacement
   h. Voltage and resistance measurements of high pressure injectors
   i. Amperage mapping of high pressure injectors
   j. Input devices
   k. Output devices
   l. Computer-controlled gasoline direct fuel injection systems
   m. Advanced mapping of turbo chargers and controls
   n. Advanced scan tool programming and actuations
   o. Reference values and charts related to selecting PIDS based on symptoms
   p. Large PID map to narrow small PID map

Course Objectives

Students will be able to:

1) Describe and demonstrate standardized safety and hazardous waste handling practices.
2) Relate actual values to normal values.
3) Diagnose faults using PCED reference charts comparing values.
4) Independently perform tests on high pressure fuel systems.
5) Perform low pressure fuel system tests.
6) Release high pressure to safely repair high pressure systems.
7) Perform turbo charger performance tests.
8) Utilize the manufacturer's electronic information system to locate application, test and repair procedures as they apply to dual manifold low pressure, and gasoline direct injection turbo charged engine systems.
9) Diagnose engine performance problems with high voltage injectors.
10) Use reference values to create movies and maps of PID data to identify faults.
11) Demonstrate Mode 6 data.
12) Identify code strategy and permanent DTCs.

Method of Evaluation

A grading system will be established by the instructor and implemented uniformly. Grades will be based on demonstrated proficiency in subject matter determined by multiple measurements for evaluation, one of which must be skills demonstration.

1) Skills-based summative assessment that measures students' ability to successfully complete the necessary ASE tasks related to diagnosis, replacement, repair, and testing of automotive engine performance systems.
2) Practical exercises that measure students' progress toward mastering tasks related to diagnosis, replacement, repair, testing of engine performance systems.
3) Student portfolio of competencies record book.
4) Web based training modules.
5) Performance projects.
6) Live and recorded student skills demonstrations will be used for observation.

Special Materials Required of Student
1) Approved safety glasses
2) High speed internet connection
3) Students will have access to testing tools and equipment while on campus
4) Safety dress code is required
5) Computer, tablet, or smart device with large screen

Minimum Instructional Facilities
1) Auto tech lab (20 service bays)
2) Various training vehicles
3) Smart classroom
4) Diagnostic tools and equipment

Method of Instruction
1) Demonstration
2) Individual assistance
3) Feedback of repair processes regardless of successful or unsuccessful

Out-of-Class Assignments
1) Reading assignments
2) Writing assignments
3) All web based training must be completed prior to "Test Out"
4) Student must pass online pretests prior to laboratory tests
5) Portfolio will be used to display competencies

Texts and References
1) Required (representative examples):
   a. Student workbooks – will be provided electronically.
   b. Required:-CDX Master Automotive Technician Series, 2020, **ISBN:** 9781284170917
   c. Web Based Training Modules will be provided electronically.
   d. Workshop Manuals will be provided electronically.
2) Supplemental: None

Student Learning Outcomes
Upon successful completion of this course, students will be able to:
1) Accurately demonstrate repair of various conditions of advanced engine performance systems.
2) Describe and diagnose advanced drivability systems by navigating the workshop manual based on symptoms or codes.
3) Communicate effectively and professionally in a diverse setting that includes prospective colleagues, clients, and supervisors.
4) Comply with environmental health and safety regulations at the state and federal levels.