

AUT 181 (A8)
ENGINE PERFORMANCE I

COURSE DESCRIPTION:

Prerequisites: None

Corequisites: None

This course covers the introduction, theory of operation, and basic diagnostic procedures required to restore engine performance to today's vehicles equipped with complex engine control systems. Topics include an overview of engine operation, ignition components and systems, fuel delivery, injection components and systems and emission control devices and emerging engine performance technologies. Upon completion students should be able to describe operation of and diagnose/repair basic ignition, fuel and emission related drivability problems using

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LEARNING OUTCOMES:

Upon completion of this course the student will be able to:

- a. Identify engine type and engine management systems.
- b. Utilize technical specifications and troubleshooting procedures.
- c. Analyze and test engine mechanical soundness.
- d. Diagnose and repair vacuum leaks.
- e. Diagnose electrical/electronics system problems and make necessary repairs.
- f. Perform no starting and hard starting diagnostic procedures.
- g. Troubleshoot driveability problems and determine needed repairs.
- h. Perform on-board computer diagnostics.
- i. Inspect and repair engine fuel systems.
- j. Inspect and service exhaust systems.
- k. Perform routine scheduled maintenance procedures.

OUTLINE OF INSTRUCTION:

- I. General Engine Operation (Overview/Review)
 - A. Engine Designs and Classifications
 - 1) Gasoline
 - 2) Diesel
 - 3) Piston
 - 4) Rotary
 - 5) Hybrids
 - 6) New Designs/New Technology
 - a. Fuel Cells

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- 6) Fans, Clutches
- D. Fuels and Fuel Systems
 - 1) Fuels
 - a. Gasoline
 - b. Diesel
 - c. Alcohol and Blends
 - d. CNG, LPG
 - e. Hydrogen
 - f. Others
 - 2) Fuel Injection
 - a. Multi-port
 - b. Throttle Body
 - 3) Delivery
- E. Ignition Systems
 - 1) “DI” Distributor Ignition
 - 2) “EI” Distributorless Ignition
 - 3) “COP” Coil On Plug
- F. Emission Control Systems
 - 1) PCV Positive Crankcase Ventilation
 - 2) EGR Exhaust Gas Recirculation
 - 3) EVAP Evaporative Control Systems
 - 4) AIR Injection Systems
 - 5) Catalytic Converter Systems

III. The Diagnostic Process

- A. Verify the Problem
- B. Gather Customer Information and Vehicle History
- C. Visual Inspection and Basic Tests
- D. Retrieve and Record DTC’s
- E. Collect Service Information and Check TSB’s
- F. Scan Tool Data
- G. Identify the Problem Cylinder or System
- H. Repair Problem and Determine Root Cause
- I. Verify Repair and Clear Codes

IV. Scan Tool Introduction

- A. Diagnostic Trouble Codes
 - 1) Retrieval
 - 2) Clearing
- B. Data Streams (scan tool data)
- C. OBD I On-Board Diagnostics (Gen I)
 - 1) History
 - 2) System(s) Overview
- D. OBD II On-Board Diagnostics (Gen II)
 - 1) History
 - 2) System(s) Overview

V. General “Mechanical” Condition
A. Compression Tests

- iii. Optical Pick-ups/Sensors
 - iv. Control Modules
 - 2) Secondary
 - i. Ignition Coil Secondary Winding
 - ii. Dndingy3Td (2))Tj)

- XI. Diagnosis and Repair of Driveability Problems
 - A. MIL Malfunction Indicator Light Diagnosis
 - B. Interpretation of Scan Tool Data
 - C. OBD II Requirements
 - 1) Drive Cycles
 - 2) Monitors
 - 3) Utilization of Snapshot/Freeze Frame Data
 - 4) Output Controls
 - D. No MIL - Symptom Based Diagnosis

- XII. Routine and Preventative Maintenance
 - A. The “Tune-up” Process and Procedure
 - B. 30K and 60K Maintenance
 - C. Timing Belt Replacement

- XIII. New Engine Performance Technologies

REQUIRED TEXTBOOKS AND MATERIALS:

To be announced by the instructor.

NATEF:

This course fulfills 80 of the 220 hours required by **NATEF** for A8. See COE 111.