South Central College

AST 2723 Fuel Systems I

Common Course Outline

Course Information

Description This course covers the principles of operation of the various types of automotive fuel systems. Fuel system component identification, operation, and testing is included in this course. Gasoline fuel system diagnosis and repair will be emphasized. (Prerequisite: Admission to the Automotive Service program)

Total Credits 3

Total Hours 72

Types of Instruction

Instruction Type	Credits/Hours
Lecture	1.5/24
Lab	1.5/48

Pre/Corequisites

Prerequisite Admission into the Automotive Service program

Institutional Core Competencies

Communication - Students will be able to demonstrate appropriate and effective interactions with others to achieve their personal, academic, and professional objectives.

Critical and Creative Thinking - Students will be able to demonstrate purposeful thinking with the goal of using a creative process for developing and building upon ideas and/or the goal of using a critical process for the analyzing and evaluating of ideas.

Course Competencies

1. Exhibit professionalism and demonstrate proper shop safety procedures

Learning Objectives

Exhibit professional conduct, act responsibly, and accept responsibility for the successful and timely completion of assignments
Identify and follow all shop operating and safety procedures

2. Describe different types of fuel

Learning Objectives

Describe the different types of fuels used in an internal combustion engine
Explain air fuel ratio and the principles of combustion
Describe the effect of the air-fuel ratio on engine operation

Explain the effect of the air-fuel ratio on HC, CO, O2, and NOx emissions

3. Explain the operation of the various fuel systems

Learning Objectives

Identify and describe the various types of fuel injection systems
Identify fuel injection system components and explain the operation of the each component
Explain the operation of the electric fuel pump and the gasoline direct injection high pressure mechanical fuel pump
Explain the intake air induction system operation

4. Test the fuel system - determine necessary action

Learning Objectives

Explain and demonstrate engine vacuum testing and vacuum leak detection methods
Inspect throttle body and the intake manifold gasket for vacuum leaks and/or unmetered air entering the engine
Inspect and test the fuel pressure, pump volume, pump electrical circuit, pressure regulator, and pump control components
Inspect and test vacuum operated components and electrical components including connections and controls
Inspect and test idle speed control system components, wiring, and verify proper idle control operation
Inspect and test the intake air system components, inspect the intake air system duct-work for leaks

5. Evaluate the fuel system - determine necessary action

Learning Objectives

Use bi-directional control to test the operation of fuel system components
Measure fuel injector resistance and perform a fuel injector balance test
Use a graphing meter or digital storage oscilloscope to graph the fuel injector and fuel pump waveforms
Analyze cold and warm engine performance problems, use a scan tool to check for stored diagnostic trouble codes

6. Diagnose the fuel system - determine necessary action

Learning Objectives

Diagnose idle concerns, including stalling, unstable idle, and elevated emissions on fuel injected engines
Diagnose no-start or hard starting problems on fuel injected engines
Diagnose drivability concerns, misfire, hesitation, surging, power loss, spark knock, poor mileage, and emission problems on fuel injected engines

7. Inspect, repair, or replace fuel system components

Learning Objectives

Check fuel for contamination, alcohol content, and quality
Replace the fuel pump and fuel filter
Inspect, test, and/or replace the fuel injectors
Inspect and/or replace fuel injection system electrical connectors and terminals
Inspect air filter housing, duct-work, and replace the air filter