

Gas Engine Classes

Gas I CAT 500

Length: 40 hours (5 days)

Course Format: 70% ILT, 30% Lab, 0% Web

Prerequisite(s): None

Instructor(s): William Miles

Student Maximum: 10

Student Minimum: 4

Course Cost: \$1950

Course Description:

Gas Engines I (2900) students study the basic operating principles of gaseous-fueled engines. Emphasis is on fuel, horsepower calculations, maintenance, fuel system, intake and exhaust system, and the timing and ignition system. In addition, the students learn about the media resources available through SIS (Service Information System). Lab engines are a G3406 and a G3512.

Course Objectives:

- Explain the operating principles of basic gaseous fueled engines
- Conduct a 4-stroke cycle comparison with diesel
- Understand air/fuel ratio control
- Evaluate pre-ignition, detonation, and misfire
- Review the definitions of some common gas engine terms
- Perform component identification on a gas engine
- Calculate the effect of temperature, altitude, and low heat value on developed horsepower
- Calculate the effect of the methane number on engine timing and performance
- Identify the proper media and procedures for preventive maintenance practices and schedules
- Perform cooling system, lubrication system, and fuel system maintenance
- Determine the effects of aftercoolers on engine performance
- Understand operation, define correct settings, and adjust an engine pressure regulator
- Measure and calculate the pressure relationships
- Understand operation and adjustments of a carburetor
- Assess reusability of diaphragm
- Check and properly adjust carburetor linkage
- Measure and adjust the butterfly angle
- Determine the effects of turbochargers on engine performance
- Determine the effects of waste gates on engine performance
- Adjust and set the operating pressure of the adjustable waste gate
- Correctly set up and use an exhaust-free oxygen analyzer
- Study the pressure relationships
- Perform a startup procedure
- Correctly install and time an altronic III magneto
- Perform a diagnostic and troubleshooting procedure lab

Gas II CAT 501

Length: 40 hours (5 days)

Course Format: 80% ILT, 20% Lab, 0% Web

Prerequisite(s): CAT 500 and Basic Electricity (Form SEBV0534)

Instructor(s): Richard Blakney

Student Maximum: 10

Student Minimum: 4

Course Cost: \$1950

Course Description:

Gas Engines II (G3300, G3400, and G3500 Stoichiometric & Lean Burn Gas Engine Principles) covers electrical systems and special considerations necessitated by lean burn low emissions gas engines, specifically the G3500 Engine families. One day is spent in review of Stoichiometric principles. The remainder of the class is spent discussing principles of lean burn engines, the advanced wiring associated with the accompanying control systems, and doing tests and adjustments on running G3512 Lean Burn Natural Gas air/fuel ratio controlled engines. The effective use of Caterpillar service literature will be practiced.

Note: Students are asked to bring a calculator and safety glasses to class. Students should bring their Basic Electricity training booklet (\$10) or they will be charged for a duplicate. Order from the Caterpillar Media Logistics System. Students should also bring work clothes for the lab and are required to wear work shoes (leather soles) in the building and lab area.

Course Objectives:

- Check and properly adjust actuator and carburetor linkages
- Calculate the effects of turbochargers, aftercoolers, and exhaust bypass valves on engine performance
- Calculate the effects that altitude and temperature changes have on engine performance
- Calculate the minimum gas supply pressure requirement for gas engines with or without transient loads and Brake Specific Fuel Consumption (BSFC) for a given BTU fuel
- Connect and use an exhaust-free oxygen emission analyzer to set exhaust oxygen/emissions
- Connect and properly use the Digital Diagnostic Tooling (DDT) and Cat ET for setup and self-test of the ADEM A3 and EIS, as well as the Timing Cal
- Study the operation of the engine Status Control Module (SCM) and its role in engine protection
- Troubleshoot the ADEM A3 system with Cat ET and the troubleshooting guide
- Troubleshoot the EIS Air/Fuel Ratio Engine Control Module
- Identify starting circuits, relays, and troubleshoot a G3512 Lean Burn Natural Gas air/fuel ratio controlled engine using advanced wiring schematics associated with the accompanying control systems on the engine

Gas Engine Classes

ADEM III CAT 520

NEW!

Length: 40 hours (5 days)

Course Format: 65% ILT, 35% Lab, 0% Web

Prerequisite(s): None

Instructor(s): William Miles

Student Maximum: 8

Student Minimum: 4

Course Cost: \$1950.00

Course Description:

The ADEM III course provides learners with an understanding of ADEM III control systems with an emphasis on understanding wiring schematics, relevant service literature, and their effective use in the troubleshooting process. Students also develop the skills required to properly setup and tune G3500 Series Engines to the desired emission specifications. Students use the emission analyzer as a tool during lab activities to understand the affects of cylinder temperatures, as they relate to required emission levels and the adverse affects they can have on the life of the engine.

Course Objectives:

- Understand the operating principles of Caterpillar ADEM III gas engine controls
- Understand the electrical principles of the ADEM III control system
- Understand wiring diagrams and symbols
- Locate relevant service literature needed for the repair process
- Develop troubleshooting skills to diagnose and effectively repair ADEM III control systems
- Understand the operations of the air/fuel ratio of the engine control system
- Understand the effective use of the emission analyzer to aid in troubleshooting and achieving desired emission levels
- Understand the process during the initial installation and startup process

G3516 ADEM III Introduction and Theory CAT 521

NEW!

Length: 40 hours (5 days)

Course Format: 65% ILT, 35% Lab, 0% Web

Prerequisite(s): None

Instructor(s): Richard Blakney

Student Maximum: 8

Student Minimum: 4

Course Cost: \$1950.00

Course Description:

The G3500B Introduction and theory course gives students a basic understanding of the operations of the engine and the air/fuel ratio of the engine control system. The course provides students with the knowledge to safely gather information and understand the process during the initial installation and startup procedures.

Course Objectives:

- Identify significant iron changes
- Understand engine speed governing
- Set the Air-Fuel Ratio Control to desired level
- Locate sensors
- Determine correct engine timing (Methane Number Program)
- Understand the Hydrax actuator system
- Understand ADEM III electronic control systems
- Develop basic troubleshooting strategies

G3516B ADEM III Start-Up CAT 522

NEW!

Length: 40 hours (5 days)

Course Format: 65% ILT, 35% Lab, 0% Web

Prerequisite(s): None

Instructor(s): Richard Blakney

Student Maximum: 8

Student Minimum: 4

Course Cost: \$1950.00

Course Description:

This course involves an expansion on the theory discussions in the G3516B Introduction and Theory course. In this course, students demonstrate the ability to complete tasks required within Caterpillar Electronic Technician (ET) in order to be able to set up the G3516B engine. This course only covers engine installation and start-up guidelines and does not cover package installation and application guidelines.

Course Objectives:

- Understand the history of changes on ADEM III and the reasons for the changes
- Understand program parameters
- Understand the control system components
- Understand the ignition system and components as they relate to ADEM III
- Understand the fuel system and components as they relate to ADEM III
- Understand the monitoring and protection system

Applied Failure Analysis - Gas Engines CAT 525

NEW!

Length: 40 hours (5 days)

Course Format: 50% ILT, 50% Lab, 0% Web

Prerequisite(s): None

Instructor(s): Ron Spohrer, Dan Price

Student Maximum: 10

Student Minimum: 4

Course Cost: \$1950.00

Course Description:

This class is designed to instruct service personnel on the techniques and procedures required to correctly identify probable causes of failure. Students gain knowledge and develop skills by utilizing the basics of metallurgy, characteristics of wear, fracture identification, and proper visual examination or failed components. After classroom instruction in these basics, students learn to apply the fundamentals to major components of gaseous-fueled engines during laboratory instruction.

Course Objectives:

- Use the eight steps of failure analysis
- Define specific wear and fracture patterns
- Perform report functions to include correct terminology
- Use visual examination aids
- Apply knowledge to a series of failed components