

San Bernardino Valley College
Curriculum Approved: May 6, 2002
Last Updated: May 1, 2002
Course ID Number: DIESEL 021

Course Title: Diesel Engines - Heavy Duty

Course Description: Theory and practical shop work in the repair, operation, and maintenance of heavy-duty industrial diesel engines and fuel injection systems. Course includes general trouble-shooting and diagnostic testing. This course may be used in preparation for the Automotive Service Excellence (ASE) National Test.

RATIONALE:

Course ID Number: To classify this course as a diesel course.

Course Title & Description: Rewriting the course title and description to reflect the latest changes in technology.

I. CATALOG DESCRIPTION:

- A. Department Information:
Division: Technical
Department: Automotive
Course ID: DIESEL 021
Course Title: Diesel Engines - Heavy Duty
Units: 4
Lecture: 3 Hours
Laboratory: 3 Hours
Prerequisite: None

- B. Catalog and Schedule Description:
Theory and practical shop work in the repair, operation, and maintenance of heavy-duty industrial diesel engines and fuel injection systems. Course includes general troubleshooting and diagnostic testing. This course may be used in preparation for the Automotive Service Excellence (ASE) National Test.

II. NUMBER OF TIMES COURSE MAY BE TAKEN FOR CREDIT: One

III. EXPECTED OUTCOMES FOR STUDENTS:

Upon completion of the course the students should be able to:

- A. Be aware of the safe use and care of tools and chemicals, the proper placement and storage of parts and components, and the correct protective clothing and safety gear for various situations.
- B. Distinguish design, operating principles, and the component parts of the two-stroke and four-stroke diesel engine.
- C. Disassemble, inspect and repair parts, which are reusable in a manner consistent with accepted trade practices.
- D. Assemble a diesel engine in accordance with manufacturer instructions and specifications. The student will identify and order new diesel engine parts as required.
- E. Recognize the design, operation, and component parts of the heavy-duty industrial diesel fuel system. The student will diagnose fuel system problems. The student will perform normal servicing of the fuel system in a manner consistent with accepted industry standards.
- F. Evaluate the importance of a properly tuned engine. The student will perform all necessary adjustments, demonstrate sequential steps taken in diagnosing tune-up problems, and remove and replace components in a manner consistent with accepted industry standards.
- G. Perform a visual inspection and analyze the cause or failure of defective engine components in a manner consistent with accepted trade practices.
- H. Perform labor tasks as outline in the NATEF certification guidelines.
- I. Apply knowledge and skills attained to pass the Automotive Service Excellence (ASE) National Test.

IV. COURSE CONTENT:

- A. Basic Safety Rules
- B. Introduction to Heavy-Duty Industrial Diesel Engines
 1. General Heavy-Duty Shop Safety
 2. Tools and Equipment
 3. Engine Oil
 4. Diesel Fuel
 5. Engine Performance Terminology
 6. Cycle Operation
 7. Combustion Chamber Types
 8. Basic Engine Components
- C. Diesel Engine Components and Service
 1. Cylinder Block

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2. Camshaft
 3. Cylinder Sleeve
 4. Crankshaft
 5. Bearings
 6. Connecting Rod
 7. Piston and Rings
 8. Lubrication Pump and Oil Cooler
 9. Cylinder Head and Valves
 10. Valve-Train Mechanism
 11. Flywheel Housing, Flywheel, and Timing Cover
 12. Engine Brakes and Hydraulic Retarders
- D. Diesel Engine Systems
1. Air-Intake Systems
 2. Exhaust Systems
 3. Cooling Systems
- E. Fuel-Injection Systems
1. Introduction to Heavy-Duty Fuel-Injection Systems
 2. Governors
 3. Emission Controls
 4. Fuel-Injection Nozzles and Holders
 5. Cummins Fuel-Injection Systems
 6. Detroit Diesel Fuel-Injection Systems
- F. Break-In, Trouble-Shooting, and Tune-Up
1. Starting the Reconditioned Engine
 2. Trouble-shooting Heavy-Duty Industrial Diesel Engines
 3. Heavy-Duty Industrial Diesel Engine Tune-Up
- G. NATEF Task List Diesel Engines Test (T2)

V. METHODS OF INSTRUCTION:

Methods of instruction will vary from instructor to instructor but may include: Classroom lecture; direct demonstration by instructor; guided practice by the learner and presentations by field experts.

VI. TYPICAL ASSIGNMENTS:

Typical assignments will vary from instructor to instructor but may include:

- A. Write a two-page paper describing the effectiveness of diesel injection for fuel economy.
- B. After performing a cylinder balance test and a fuel pressure test, determine the cause for a low power complaint.

VII. EVALUATION(S):

A. Methods of evaluation will vary from instructor to instructor but may include:

1. Oral and written tests
2. Completion of lab exercises
3. Comprehensive written final exam

Typical Questions:

- a) Technician A says that during normal injection timing a lower nitrogen oxide content is produced at the exhaust but a higher percentage of hydrocarbons is produced. Technician B says that this is incorrect; instead, at normal injection timing there is a higher nitrogen oxide content but a lower hydrocarbon content. Determine which technician is correct and explain why?
 - b) Technician A says that a by-product of combustion is carbon dioxide, whereas technician B says that carbon monoxide is formed as a by-product of combustion. Briefly describe the chemical reactions of diesel fuel combustion and explain which technician is the most correct.
- B. Frequency of evaluation will vary from instructor to instructor but may include:
1. Minimum of 18 lab exercises
 2. Tests at the end of each lesson

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3. One mid-term examination
4. One final examination

VIII. TYPICAL TEXT(S):

Norman/Corinchock/Scharff, Diesel Technology, Goodheart-Willcox, 1998

John F. Kershaw/Sean Bennet, Today's Technician: Truck Diesel Engines, Delmar, 2000

Sean Bennett, Medium/Heavy Duty Truck Engines, Fuel and Computerized Management Systems, Delmar, 1999

Ian Andrew Norman/Robert Scharff/John A. Corinchock, Heavy Duty Truck Systems, Delmar, 1996

IX. OTHER SUPPLIES REQUIRED OF STUDENTS: Safety Glasses