San Bernardino Valley College
Curriculum Approved: May 6, 2002
Last Updated: May 1, 2002
Course ID Number: DIESEL 020

Course Title: Diesel Engines - Light Duty

Course Description: Theory and practical shop work in the repair, operation, and maintenance of light duty automotive 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.

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I. CATALOG DESCRIPTION:

A. Department Information:

Division: Technical
Department: Automotive
Course ID: DIESEL 020
Course Title: Diesel Engines - Light 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 light duty automotive 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.

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

III. EXPECTED OUTCOMES FOR STUDENTS:

Upon completion of the course the student 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 automotive 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. Apply knowledge and skills attained to pass the Automotive Service Excellence (ASE) National Test.

IV. COURSE CONTENT:

A. Basic Safety Rules
B. Introduction to Automotive Diesel Engines
   1. Diesel Engine Fuel Efficiency
   2. The Diesel Engine and Pollution
   3. Other Advantages of the Diesel
   4. Diesel Engine Disadvantages
   5. Careers in Automotive Diesel Technology
   6. Preparing for a career
   7. General Automotive Shop Safety

C. Diesel Engine Operation
   1. Basic Parts
   2. Four-Stroke-Cycle Principle
   3. The Valve Gear or Valve Train
   4. Two-Stroke-Cycle Principle

D. Diesel Engine Components
   1. Cylinder Block
   2. Cylinder Arrangement
   3. Crankshaft
   4. Main Bearings and Caps
   5. Pistons
   6. Piston Rings
   7. Piston Pin
   8. Connecting Rod
   9. Cylinder Head
   10. Valve Gear or Valve Train
   11. Valve Assembly
   12. Camshaft
   13. Valve Lifters
   14. Push Rod and Rocker Arm Assembly

E. Diesel Lubrication Systems
   1. Reducing Friction
   2. Lubricating Oil
   3. Oil Pan, Oil Pump and Pick-up Screen
   4. Oil Filter and Oil Circulation
   5. Bearing Oil Clearance

F. Diesel Engine Liquid Cooling Systems
   1. Coolant Passages
   2. Coolant Pump
   3. Heat Exchanger
   4. Radiator Pressure Cap, Thermostat and Fan

G. Diesel Fuel Systems
   1. Diesel Fuel
   2. Fuel Injection Systems
      a) In-line Fuel Injection Systems
      b) Distributor Fuel Injection Systems
   3. Review of Fuel Flow

H. Diesel Engine Maintenance
   1. Valve Adjustment
   2. Lubricating System Maintenance
   3. Cooling System Maintenance
   4. Fuel System Maintenance
   5. Injection Pump Linkage and Speed Adjustments
   6. Emission Control System Maintenance
   7. Air Cleaner Maintenance

I. Diesel Engine Troubleshooting
   1. Engine Will Not Crank
   2. Engine Will Not Start
   3. Engine Runs Rough
   4. Engine Runs with Loss of Power
   5. Engine Runs with Excessive Noise

J. Servicing Diesel Engine Cylinder Heads

1. Removing Accessories
2. Removing the Cylinder Head
3. Disassembling the Cylinder Head
4. Cleaning the Components and Inspecting for Wear
5. Grinding Valves
6. Servicing Valve Guides
7. Servicing Valve Seats
8. Checking Valve Springs
9. Cylinder Head Reassembly and Installation

K. Servicing Diesel Cylinders and Piston Assemblies
1. Removing the Piston Assemblies
2. Cleaning the Components
3. Inspecting Cylinders for Wear
4. Metrology -- Use of Precision Measurement Tools
5. Piston Inspection and Measurement
6. Inspecting the Connecting Rod and Piston Pin
7. Reassembling the Piston Assembly
8. Installing the Piston Assembly
9. Measuring Oil Clearance

L. Complete Diesel Engine Service
1. Disassembling the Cylinder Block
2. Cleaning the Components
3. Inspecting the Cylinder Block
4. Inspecting the Crankshaft
5. Inspecting the Camshaft
6. Inspecting Valve Lifters and Push Rods
7. Cylinder Block Reassembly
8. Installing the Crankshaft
9. Installing the Camshaft
10. Completing the Reassembly

M. NATEF Task List B 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 differentiating two-stroke cycle and four-stroke cycle diesel engines.
B. Calculate the compression ratio after determining the bore, piston stroke, and combustion chamber volume.

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 a long ignition delay period would result in a rough-running engine. Technician B says that a long ignition delay period would result in an engine knocking sound, due to the high pressure created within the combustion chamber. Explain which technician is correct and why?
b) Technician A says that combustion in a diesel engine can take place only when the carbon and hydrogen molecules are atomized, whereas technician B says that the

carbon and hydrogen must mix with the oxygen in the combustion chamber in a vaporized state to initiate successful combustion. Explain which technician is correct and why?

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
   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

IX. OTHER SUPPLIES REQUIRED OF STUDENTS: Safety glasses