

**I. COURSE INFORMATION:**

Division: Transportation  
Department: Diesel  
Course ID: DIESEL 024  
Course Title: Advanced Heavy-Duty Diesel Engines  
Units: 4  
Lecture: 3 Hours  
Laboratory: 3 Hours  
Prerequisite: DIESEL 021

Course Description: Theory and practical shop in the repair, operation and the construction, of heavy-Duty diesel engines. Includes principles of diesel turbo-chargers and blowers; two and four cycle combustion systems. This course is an intermediate engine rebuild class

Schedule Description: Theory and practical shop work in the repair, operation, and maintenance of various heavy Duty diesel engines. Includes general trouble-shooting and diagnostic testing of engine components and systems found on most engines from a variety of engine manufacturers.

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

**III. EXPECTED OUTCOMES FOR STUDENTS:**

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

- A. Identify procedures for 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. Disassemble, inspect, and repair parts which are reusable in a manner consistent with accepted trade practices.
- C. Assemble a diesel engine in accordance with manufacturer instructions and specifications. The student will identify and order new diesel engine parts as required.
- D. Identify the systems design, operation, and component parts of the heavy-equipment diesel engine 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.
- E. 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.
- F. Inspect and analyze the cause or failure of defective engine components in a manner consistent with accepted trade practices. A Heavy-Duty diesel engine refers to diesel engines used in construction equipment, and heavy-duty trucks.
- G. Write a comprehensive failure analysis report about a failed engine component.
- H. Identify various design, operating principles, and the component parts of the two-stroke and four-stroke diesel engine.
- I. Differentiate the constant volume combustion cycle from the constant pressure combustion cycle.
- J. Contrast, and compare the governing, and horsepower controls of light duty and medium duty diesel engines.
- K. Describe in detail the function of the overlap section of the camshaft lobe arrangement.

**IV. CONTENT:**

- A. Introduction to diesel engines
  1. General 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
- B. Diesel engine components and service
  1. Cylinder block
  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 retarder
- C. Diesel engine systems
1. Air-intake systems
  2. Exhaust systems
  3. Cooling systems
- D. Break-in, troubleshooting, and tune-up
1. Starting the reconditioned engine
  2. Troubleshooting diesel engines
  3. Diesel engine tune-up

**V. METHODS OF INSTRUCTION:**

The methods of instruction will include, but are not limited to:

- A. Lecture and direct demonstration by instructor;
- B. Guided practice by the learner and presentations by field experts.

**VI. TYPICAL ASSIGNMENTS:**

A. Read assigned chapters from the textbook and answer all review questions that follow the chapter.

Typical Questions:

1. Define engine bore, stroke, and displacement.
2. How is the compression ratio of an engine calculated?
3. What is the appropriate air/fuel ratio of a diesel engine?

B. Typical Lab Assignments:

1. Disassemble, inspect, and repair parts;
2. Assemble a diesel engine;
3. Troubleshoot the cause or failure of defective engine components, in a manner consistent with accepted trade practices.

**VII. EVALUATION:**

A. Student progress will be evaluated by:

1. Oral and written tests;
2. Completion of classroom and lab exercises in accordance with manufacturers specifications;
3. Writing a comprehensive failure analysis report about a selected diesel engine component; and
4. A comprehensive written final exam. Typical questions:
  - a) What is the purpose of the intake stroke?
  - b) Describe the basic operating principle of a two-stroke-cycle diesel engine.

B. Frequency of evaluation:

1. Weekly assignments
2. One midterm examination
3. One final examination

**VIII. TYPICAL TEXT(S):**

Diesel Technology; Norman, Corinchock, Scharff; Goodheart-Willcox, Inc.; 2001

Diesel Engine and Fuel System Repair Fifth Edition; John F. Dagel and Robert N. Brady; Prentice Hall; 2002

**IX. OTHER SUPPLIES REQUIRED OF STUDENTS:** Notebook and safety glasses