

**Course Outline for AUTO A9**  
**LIGHT VEHICLE DIESEL ENGINES**  
**Effective: Spring 2018**

**I. CATALOG DESCRIPTION:**

AUTO A9 — LIGHT VEHICLE DIESEL ENGINES — 4.00 units

An in depth study of diesel engines: mechanical, measurement, and assembly. A study of the above mentioned components including theory, teardown, evaluate, qualifying, and rebuilding. Diesel engine performance including emissions, turbos, exhaust and intake systems. This class' emphasis is on diesel engines and diesel engine performance/emissions. Students are encouraged to enroll in Automotive Lab concurrently.

2.00 Units Lecture 2.00 Units Lab

**Prerequisite**

AUTO INTR - Automotive Service and Introduction  
 with a minimum grade of C  
 (May be taken concurrently)

**Grading Methods:**

Letter or P/NP

**Discipline:**

- Automotive Technology

	<u>MIN</u>
<b>Lecture Hours:</b>	36.00
<b>Lab Hours:</b>	108.00
<b>Total Hours:</b>	144.00

**II. NUMBER OF TIMES COURSE MAY BE TAKEN FOR CREDIT: 1**

**III. PREREQUISITE AND/OR ADVISORY SKILLS:**

**Before entering the course a student should be able to:**

A. AUTOINTR

1. utilize and apply hazardous waste handling;
2. identify and describe uses of automotive related tools;
3. identify different transmissions, understand theory of operation of both manual and automatic transmissions and fluid requirements;

**IV. MEASURABLE OBJECTIVES:**

**Upon completion of this course, the student should be able to:**

- A. Demonstrate the basic safety procedures of handling hazardous waste materials.
- B. Explain the history of diesel powertrain evolution.
- C. Operate a wide variety of precision measurement equipment.
- D. Explain four cycle engine theory and identify key components involved.
- E. Teardown typical diesel engine assembly.
- F. Take measurements of engine components and compare to specifications.
- G. Qualify new and used engine components.
- H. Rebuild engine to manufacturer specifications.
  - I. Identify and explain the function of diesel emission componets
  - J. Identify and explain the function of diesel turbo and intake componets
  - K. Identify and explain the function of diesel emission exhaust componets

**V. CONTENT:**

- A. Safety
  1. Tool usage and nomenclature
  2. Proper disposal procedures
  3. Environmentally conscious decisions
- B. Powertrain evolution
  1. The first four cycle diesel engines
  2. Current engines

3. Horsepower and emission trade offs
4. Environmental decisions driving design
- C. Measurement
  1. Micrometer
    - a. Vernier
    - b. Caliper
    - c. Dial bore gauge
    - d. Snap gauges
    - e. Straight edge
    - f. Feeler gauges
    - g. Hole gauges
- D. Four cycle engine theory
  1. Intake, compression, power, exhaust
    - a. 360 degrees in one degree intervals
    - b. Valve overlap
    - c. Timing concerns and tricks
    - d. Street vs. racing
  2. DOHV vs. OHV vs. Valve in block design
    - a. Pros and cons of each
    - b. Current technology
  3. Key Valve train components
  4. Key bottom end components
  5. Camshaft timing
    - a. Static camshaft
    - b. Dynamic camshaft
    - c. Electronic valves
  6. Crankshaft design and balance
  7. Cylinder head design
    - a. Single valve
    - b. Multiple valve
- E. Engine Teardown
  1. Removal and identification of external components
    - a. Special procedures
      1. Loosening sequence
  2. Removal and identification of internal components
    - a. Special Procedures
      1. Loosening sequence
- F. Component measurement
  1. Specification lookup
  2. Comparison
    - a. Component diagnosis
      1. Failure analysis
- G. Evaluation of replacement components
  1. Correct component?
  2. New and used part comparison
- H. Engine rebuilding
  1. Manufacturer Procedures
    - a. Component sequence
    - b. Torque specifications
    - c. Tightening sequences
    - d. Special concerns
      1. Assembly lube
      2. Gaskets and sealers
  2. Dynamic engine torque
  3. Proper engine timing
    - a. Camshaft to crankshaft
    - b. Crankshaft to balancershaft
- I. Different types of fuel delivery systems.
  1. Mechanical Injection
  2. Direct Injection
  3. HEIU
- J. Fuel systems testing
  1. Perform pressure test
  2. Evaluate volume test and fuel composition
  3. Electronic pulse with modulation evaluation
- K. Diagnose various Engine Performance concerns
- L. Emission system diagnostics and testing
- M. Diagnostic service information
- N. Exhaust system evaluation
- O. Turbos
- P. Valve adjustments
- Q. Professionalism
  1. Safety glasses
  2. Working shop expectations
  3. Attitude
  4. Cleanliness
  5. Maintenance of work areas and tools

## VI. METHODS OF INSTRUCTION:

- A. **Lab** - Group and individual laboratory activities
- B. **Lecture** -

## VII. TYPICAL ASSIGNMENTS:

- A. Lecture based assignments
  1. Lecture on Engine Construction
- B. Lab based assignments
  1. Remove cylinder heads and check for specifications
- C. Text reading assignments
  1. Read Chapter One in text

VIII. EVALUATION:

A. **Methods**

1. Exams/Tests
2. Quizzes
3. Home Work
4. Lab Activities

B. **Frequency**

1. Exams/Test:One Midterm one Final
2. Weekly quizzes
3. Bi-weekly group lab assignments
4. Weekly homework

IX. TYPICAL TEXTS:

1. Halderman, . *Automotive Technology Principles, Diagnosis, and Service*. 5 ed., Pearson, 2016.
2. Heard, . *Heavy Duty Equipment Technology: A systems Approach*. 1 ed., Pearson, 2016.
3. Halderman, . *Automotive Engines:Theory and Servicing*. 9th ed., Prentice Hall, 2018.

X. OTHER MATERIALS REQUIRED OF STUDENTS:

- A. Safety Glasses