

**Course Outline for NAUT CA9**  
**CONCEPTS OF LIGHT VEHICLE DIESEL ENGINES**

**Effective: Fall 2021**

**I. CATALOG DESCRIPTION:**  
 NAUT CA9 — Noncredit

This class is lecture only and non-credit. 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's emphasis is on diesel engines and diesel engine performance/emissions.

**Grading Methods:**

Pass/No Pass

**Discipline:**

- Automotive Technology

**Noncredit Category**

I - Short-Term Vocational

	<b>MIN</b>
<b>Total Noncredit Hours:</b>	36.00

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

**III. 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. Identify and explain the function of diesel emission components
- F. Identify and explain the function of diesel turbo and intake components
- G. Identify and explain the function of diesel emission exhaust components

**IV. 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 tradeoffs
  - 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. Different types of fuel delivery systems.
  - 1. Mechanical Injection
  - 2. Direct Injection
  - 3. HEIU
- F. Diagnose various Engine Performance concerns
- G. Emission system diagnostics and testing
- H. Diagnostic service information
  - 1. Exhaust system evaluation
- J. Turbos
- K. Professionalism

V. METHODS OF INSTRUCTION:

- A. **Lecture** -

VI. TYPICAL ASSIGNMENTS:

- A. Lecture based assignments
  - 1. Lecture on Engine Construction
- B. Text reading assignments
  - 1. Read Chapter One in text

VII. EVALUATION:

**Methods/Frequency**

- A. Exams/Tests
  - monthly
- B. Quizzes
  - weekly

VIII. TYPICAL TEXTS:

- 1. Johanson, Chris. *Auto Engine Performance and Drivability*. 5 ed., Goodheart Wilcox, 2021.
- 2. Duffy, James. *Modern Automotive Technology*. 9 ed., Goodheart Wilcox, 2020.

IX. OTHER MATERIALS REQUIRED OF STUDENTS:

- A. Computer with internet access.