



**I. COURSE DESCRIPTION**

In this course, you will learn the construction, operating principles, testing and service techniques used in fuel systems including, fuel pumps, tanks , lines sub-systems intakes and exhaust. You will also be introduced to electronic gasoline fuel injection and diesel fuel injection systems including electronic diesel fuel injection systems.

Students will be required to follow proper safety procedures when performing the above tasks according to both Sault College Motive Power Department Standards and Vehicle Manufacturers safety regulations and specifications.

**II. LEARNING OUTCOMES AND ELEMENTS OF THE PERFORMANCE:**

Upon successful completion of this course, the student will demonstrate the ability to:

**1. *Describe function composition and properties of fuels.*****Potential Elements of the Performance:**

## Gasoline fuel

- volatility
- octane rating
- additives
- hydrocarbons
- atomization heat energy / BTU's
- Check alcohol content

## Diesel fuel

- volatility
- cetane number
- viscosity
- additives
- Sulfur content, etc.

## Alternate fuels

- LPG
- LNG
- E85
- Ethanol
- Bio diesel
- CNG

**2. *Explain the combustion principles of fuels.***

Potential Elements of the Performance:

Describe:

- oxidation reactions
- products of combustion
- HC
- CO
- CO<sub>2</sub>
- NO<sub>x</sub>
- Particulates
- Measure exhaust emissions, gas and diesel
- thermal expansion and contraction
- air fuel ratios
- atomization / vaporization
- detonation
- pre-ignition

**3. *Define the purpose construction and operation of internal and external delivery components.***

Potential Elements of the Performance:

- Describe fuel delivery components
- Identify all components attached to the fuel tank

**4. *Identify inspect and test fuel delivery sub system and emission components***

Potential Elements of the Performance:

- Replace primary and secondary fuel filters on a diesel engine.
- Describe why we use different types of fuel filters and causes of defective filters
- Remove a fuel tank from a vehicle replacing a fuel pump.
- Fabricate, repair and replace fuel lines
- Test a fuel tank sending unit and the dash gauge manually and with a scan tool
- Perform fuel pressure testing on gasoline and diesel fuel injected engines.
- Operate fuel pump with scan tool
- Identify evaporative emission components

**5. *Intake and exhaust***

Potential Elements of the Performance:

Explain the purpose and fundamentals, inspect and test intake and exhaust systems:

- volumetric efficiency
- scavenging
- manifold vacuum, boost and exhaust back pressure

- Boyle's Law, Charles Law, and Bernoulli's Theorem
- Identify and inspect exhaust system components including the catalytic convertors
- Identify SCR and DPF components
- Identify EGR system components
- Identify secondary air components

**6. *Fuel injection introduction***

Potential Elements of the Performance:

- Identify fuel injection system types and the components of gas and diesel engines.
- Identify primary fuel metering sensing devices
- Access an OBDII Fuel related trouble code using scan tools as related to fuel system diagnosis.
- Access fuel system data with applicable scan tools and lap tops.

**III. TOPICS:**

1. Fuels
2. Combustion and emissions
3. Fuel delivery subsystems
4. Identify inspect and test fuel delivery sub system components
5. Intake and exhaust systems
6. Introduction to fuel injection and scan equipment

**IV. REQUIRED RESOURCES/TEXTS/MATERIALS:**

**Title:** Heavy Duty Truck Systems

**Edition:** 5th ed.,

**Author:** Bennett

**Publisher:** Thomson Nelson Learning Canada

**Title:** Automotive Technology: A Systems Approach

**Edition:** 2<sup>nd</sup> Canadian Ed.

**Author:** Erjavec

**Publisher:** Thomson Nelson Learning Canada

Pens, pencils, calculator, 3-ring binder

The following items are mandatory in the Shop:

- CSA approved steel toe boots (high top)
- CSA approved safety glasses
- Approved coveralls

**V. EVALUATION PROCESS/GRADING SYSTEM:**

The final grade for this course will be based on the results of classroom, assignments and shop evaluations weighed as indicated:

- Classroom – 35% of the final grade is comprised of term tests
- Assignments – 10% of the final grade is comprised of a number of technical reports
- Shop – 45% of the final grade is comprised of attendance, punctuality, preparedness, student ability, work organization and general attitude
- Employability Skills – 10% of final grade is comprised of attendance, class participation, show ability to follow direction and being a team player.

(Student will be given notice of test and assignment dates in advance)

**NOTE: All assignments will be in typed format. NO hand written assignments will be accepted.**

The following semester grades will be assigned to students:

| <b>Grade</b> | <b><u>Definition</u></b>   | <i>Grade Point Equivalent</i> |
|--------------|--|-------------------------------|
| A+           | 90 – 100%  | 4.00                          |
| A            | 80 – 89%   | 3.00                          |
| B            | 70 - 79%   | 2.00                          |
| C            | 60 - 69%   | 1.00                          |
| D            | 50 – 59%   | 0.00                          |
| F (Fail)     | 49% and below  |                               |
| CR (Credit)  | Credit for diploma requirements has been awarded.  |                               |
| S            | Satisfactory achievement in field /clinical placement or non-graded subject area.  |                               |
| U            | Unsatisfactory achievement in field/clinical placement or non-graded subject area.   |                               |
| X            | A temporary grade limited to situations with extenuating circumstances giving a student additional time to complete the requirements for a course. |                               |
| NR           | Grade not reported to Registrar's office.  |                               |
| W            | Student has withdrawn from the course without academic penalty.  |                               |

#### VI. SPECIAL NOTES:

Cell phones cannot be used in the class or in the Shop as they are not only a distraction but a potential hazard.

#### Attendance:

Sault College is committed to student success. There is a direct correlation between academic performance and class attendance; therefore, for the benefit of all its constituents, all students are encouraged to attend all of their scheduled learning and evaluation sessions. This implies arriving on time and remaining for the duration of the scheduled session.

#### VII. COURSE OUTLINE ADDENDUM:

The provisions contained in the addendum located on the portal form part of this course outline.