



**I. COURSE DESCRIPTION:**

In this course, the student will demonstrate the ability to identify types and purpose of fasteners including tightening procedures. The student will be introduced to bearings, seals and sealants and the purpose of each. The student will demonstrate a working knowledge of the purpose, construction, principles of operation, and calibration of precision and non-precision measuring tools. They will also show their ability to properly lift and support vehicles using hoists and lifting equipment. Oxyacetylene, heating and cutting will also be performed as well as producing word documents and accessing trade related information from computer based software.

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. *Define the purpose and fundamentals of fasteners and perform fastener selection, retention, removal and tightening procedures***

Potential Elements of the Performance:

**Explain the fundamental characteristics of fasteners and retention techniques as to the following.**

- specifications created by Society of Automotive Engineers (SAE) standards
- specifications of International Organization of Standards (ISO)
- bolt strength
  - tensile
  - shear
- fastener grade, pitch, threads per inch, threads per millimeter
- fastener diameter, length, head size
- use of anti-seize application • factors that affect torque
  - thread condition
  - lubrication
  - compatibility
  - temperature
  - fastener composition

**Identify the construction, types, styles and application of the following fasteners.**

- bolts / nuts
- screws
- studs
- locking devices
- pins
- rivets
- keys
- washers
- retaining rings
- helicoils, timeserts
- thread sealants

**Describe fastener applications, retention techniques and metal working skills.**

- thread lockers
- torque to yield fasteners
- torque effects of wet, dry and clean threads
- locking techniques
- drilling
- tapping
- hack sawing
- filing
- riveting

**Perform the following metal working operations.**

- verify thread strengths and torque requirements for wet and dry •  
repair damaged threads
  - free seized threads, remove broken studs / cap screws
  - install helicoils and timeserts
  - apply thread locker and anti-seize
- perform metal working tasks related to
  - drilling
  - tapping
  - hack sawing
  - filing
  - riveting
  - fastener torqueing

**2. *Demonstrate the purpose, construction, principals of operation, inspection and testing of bearings, seals and sealants***

Potential Elements of the Performance

**Explain the following fundamentals.**

- friction characteristics
- effects of temperature
- lubrication
- bearing loads
  - axial / radial
- pre-load and end play
- hydrodynamic suspension

**Identify the purpose, construction and applications of bearings, seals and sealants.**

- friction bearings
- anti-friction bearings
  - ball
  - roller
  - needle • seals
  - dynamic
  - static • sealants
  - anaerobic
  - non-anaerobic
  - gaskets
- specialty sealants

**Describe cause of failure of bearings, seals and sealants.**

- scoring / spalling
- clearance
- over-heating
- vibration
- lubrication

**Perform bearing, seal and sealant removal, installation.**

- remove / install bearings -
  - non-friction
  - friction
- remove / install seals -
  - dynamic
  - static

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**Describe cause of failure of bearings, seals and sealants.**

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- lubrication

**Perform bearing, seal and sealant removal, installation.**

- remove / install bearings -
  - friction
  - non friction
- remove / install seals -
  - dynamic
  - static
- remove and install sealants and gaskets

3. ***Demonstrate a working knowledge of the purpose, construction, principals of operation, and calibration of precision and non-precision measuring tools***

Potential Elements of the Performance:

**Explain Unit conversions**

- Convert between metric and Imperial measurements including fractions.

**Identify the construction, types and application of precision measuring tools.**

- micrometers
  - inside
  - outside
  - depth
- small hole gauges
- calipers
- Vernier calipers
- telescoping gauges
- straight edges
- dial indicators
- torque wrenches
- straight edges
- cylinder gauges

**Describe measuring procedures using the following tools.**

- micrometers
  - inside
  - outside
  - depth
- small hole gauges
- calipers
- Vernier calipers
- telescoping gauges
- straight edges
- thickness gauges
- dial indicators
- straight edges
- cylinder gauges
- torque wrenches

**Perform maintenance and calibration on precision measuring tools and perform precision measurements.**

- describe maintenance / calibration procedure
  - storage
  - lubrication
  - adjustment / calibration
  - restoring critical surfaces
- perform measurement and clearance checks

**4. Apply a working knowledge and safe operating principals for the use of oxyacetylene when cutting and heating**Potential Elements of the Performance**Explain the functions, construction, and applications of oxyacetylene welding equipment.**

- tanks
- identification features
- pressure regulators
- manual valves
- gauges
- torch tips
- heating and cutting torches

**Describe the safe use of oxy-acetylene equipment.**

- personal safety equipment and clothing
- setup, inspection, ignition and shutdown sequence
- cylinder handling
- fire prevention

**Perform heating and cutting procedures.**

- heating / cutting seized fasteners / components
- heating / cutting damaged fasteners / components

**5. *Demonstrate a working knowledge of the use of a personal computer.***

Potential Elements of the Performance

**Perform the following functions on a Networked PC.**

- access trade related information
- access internet
  - browsing
  - file download
- access Email
  - reading attachments

**6. *Demonstrate the use of proper jacking and hoisting equipment used in the motive power industry.***

Potential Elements of the Performance

**Explain safe practices for hoist and lifting equipment.**

- use of safety stands, jacks
- vehicle placement and movement
- finding the lifting points
- equipment maintenance

**Identify lifting and hoisting equipment.**

- lifting capacities
- adaptors & extensions
- types of hoists and lifting equipment
- safety locks and releases

**Perform lifting of vehicles using shop lifts and hoisting equipment.**

- position vehicle / wheel chocks
- check overhead environment
- verify correct engagement of lift points
- verify balance
- verify correct use of safety lock



**III. TOPICS:**

1. Define the purpose and fundamentals of fasteners and perform fastener selection, retention, removal and tightening procedures
2. Bearings, Seals and Sealants
3. Precision Measuring Tools
4. Oxyacetylene Heating and Cutting
5. Applied Computer Skills
6. Hoisting and Lifting

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

Automotive Technology Third Canadian Edition – Text

The following items are mandatory for entrance to the Shop:

- shop coat or coveralls
- CSA approved steel toe boots (high top)
- CSA approved safety glasses

Pens, pencils, calculator, 3-ring binder

**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 – 60% of the final grade is comprised of term tests
- Assignments – 10% of the final grade is comprised of a number of technical reports
- Shop – 30% of the final grade is comprised of attendance, punctuality, preparedness, student ability, work organization and general attitude

**Students will be given notice of  
test and assignment dates in advance**

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.	

If a faculty member determines that a student is at risk of not being successful in their academic pursuits and has exhausted all strategies available to faculty, student contact information may be confidentially provided to Student Services in an effort to offer even more assistance with options for success. Any student wishing to restrict the sharing of such information should make their wishes known to the coordinator or faculty member.

**VI. SPECIAL NOTES:**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.

It is the departmental policy that once the classroom door has been closed, the learning process has begun. Late arrivers will not be granted admission to the room.

**Laptops or Cell phones are not allowed to be on in the classrooms or shop areas during class time.**

**VII. COURSE OUTLINE ADDENDUM:**

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