



**I. COURSE DESCRIPTION:**

This course introduces the student to the world of heavy equipment and truck/coach repair in the construction, material handling, agricultural, mining, forestry, equipment rental and trucking industries. Repair shop safety, hand and power tool use, measuring instruments, fork lift safety and fastener technology are all studied, along with the four and two stroke gas engine fundamentals. The emphasis of this first semester course will be two and four stroke diesel engine construction and operation, their repair and maintenance.

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

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

**1. *Identify and recommend the proper hand and power tool safe usage and tool care including torque wrenches, multipliers and precision measuring instruments.***

Potential Elements of the Performance:

- Identify by name the various tools and their proper usage and care that the heavy equipment and transportation industries require on a day to day basis.
- Recognize fastener types, standard and metric cap screw grades, their proper torque values, torque-turn fastening methods and torque sequences along with the various torque wrench types and torque multipliers.
- Recommend the proper thread repair techniques and product variety for the repair and rebuilding processes.
- Identify drill bit index types and select the correct tap and drill bit relationship from charts.
- Identify proper cleaning and protection methods for the variety of engine and hydraulic related components encountered in the trade.
- Identify fire classifications and the correct fire fighting technique and extinguisher used in such an event.
- Recommend and correctly read the proper measuring instruments used for a variety of engine and component wear assessments and assembly evaluation, including feeler gauges, micrometers, vernier calipers and dial indicators.
- Understand seal and bearing construction and operation, and choose the correct installation method and tools required, as well as the relative chemical sealants and lubricants needed.

**2. Identify the type and operating fundamentals, inspection, maintenance and recommended safe operating procedures for powered lift trucks.**

Potential Elements of the Performance:

- Understand the fundamentals of fork truck stability.
  - i. Centers of gravity and load centers
  - ii. Safe working loads
- Identify and avoid the causes of lateral and longitudinal instability.
- Recognize the need and legalities of daily inspections, logs, brake tests, overload effects, steering maneuvers, choice of travel direction, vehicle loading, stacking maneuvers, and parking.
- Recommend the safe refueling or charging strategies for gas, diesel, propane and electric fork lifts.
- Identify appropriate lifting accessories and proper rigging procedures.

**3. Differentiate between external and internal combustion engines, internal combustion types, classifications, and their cycle events.**

Potential Elements of the Performance:

- Recognize compression ignition engine volumetric efficiency, torque rise capability, and thermal efficiencies.
- Distinguish between direct and indirect combustion chambered engines and their related efficiencies and starting accessories.
- Recommend appropriate starting aids for a variety of air and water cooled diesels.
- Recognize the advantages and disadvantages of air, hydraulic, spring, and electric cranking systems.

**4. Identify the parts and components of a typical heavy diesel engine, and understand their operating relationship with the engine as a whole, and recommend proper inspection and wear measurement procedures.**

Potential Elements of the Performance

- Recognize cylinder block, liners, piston and rings, wrist pins, connecting rods, crankshaft and related hardware.
- Identify the valve train timing gear(s), camshaft, lifters, push rods, cylinder heads, rocker arms and exhaust and intake valves or ports.
- Identify engine torsional, centrifugal and secondary inertia balancers and recommend proper timing position.
- Research engine technical data from a variety of references.

**5. *Recommend an organized sequence of disassembly and inspection of a diesel engine, assessing wear and determining replacement parts and machining needed for the overhaul process.***

Potential Elements of the Performance:

- Understand the need for good housekeeping, organized bins and component care and storage during the rebuild process.
- Select a variety of nondestructive marking aids.
- Create a service report including pre-disassembled pictures.
- Recognize some measurements can be read prior to tear-down.
- Follow an approved disassembly service guide.

**6. *Recommend the approved procedure for re-assembly of a diesel engine used in the heavy equipment or transportation industry.***

Potential Elements of the Performance:

- Follow an approved re-assembly guide.
- Recommend the correct sealants and lubricants, installation tools, torque procedures and sequences for part and component re-assembly.
- Recognize correct timing gear position, crankshaft and camshaft relationship.
- Identify the correct fuel injection timing procedure.
- Recommend a proper leak test and pre-lubrication procedure prior to cranking the engine.

**III. TOPICS:**

1. Shop Safety
2. Hand and power tools
3. Fasteners
4. Measuring tools
5. Lift Truck Safety
6. Internal combustion engine fundamentals
7. Diesel starting aids and methods
8. Two and four stroke diesel construction and operation
9. Diesel engine overhaul process

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

Diesel Technology Service and Repair ( Goodheart-Wilcox )  
Diesel Technology Service and Repair Workbook  
Heavy Duty Truck Systems(4th Edition) (Thomson publisher)  
\* Safety Glasses ( CSA approved and impact resistant )  
\*Safety Toe Workboots  
\*Coveralls

## V. EVALUATION PROCESS/GRADING SYSTEM:

The Heavy Equipment Program considers both HED101-10 Theory and HED100-8 Shop to be co-requisites. Students must successfully complete both courses in the same semester.

Theory letter grades are based on;

- 70% of semester theory examination average
- 20% of semester theory assignment average
- 10% of assessed employability skills ( attendance, punctuality, work ethics, and general attitude )

The following semester grades will be assigned to students:

<b>Grade</b>	<b>Definition</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:

### Course Outline Amendments:

The professor reserves the right to change the information contained in this course outline depending on the needs of the learner and the availability of resources.

### Retention of Course Outlines:

It is the responsibility of the student to retain all course outlines for possible future use in acquiring advanced standing at other postsecondary institutions.

### Prior Learning Assessment:

Students who wish to apply for advance credit transfer (advanced standing) should obtain an Application for Advance Credit from the program coordinator (or the course coordinator regarding a general education transfer request) or academic assistant. Students will be required to provide an unofficial transcript and course outline related to the course in question. Please refer to the Student Academic Calendar of Events for the deadline date by which application must be made for advance standing.

Credit for prior learning will also be given upon successful completion of a challenge exam or portfolio.

Substitute course information is available in the Registrar's office.

### Disability Services:

If you are a student with a disability (e.g. physical limitations, visual impairments, hearing impairments, or learning disabilities), you are encouraged to discuss required accommodations with your professor and/or the Disability Services office. Visit Room E1101 or call Extension 2703 so that support services can be arranged for you.

### Communication:

The College considers **WebCT/LMS** as the primary channel of communication for each course. Regularly checking this software platform is critical as it will keep you directly connected with faculty and current course information. Success in this course may be directly related to your willingness to take advantage of the **Learning Management System** communication tool.

Plagiarism:

Students should refer to the definition of “academic dishonesty” in *Student Code of Conduct*. A professor/instructor may assign a sanction as defined below, or make recommendations to the Academic Chair for disposition of the matter. The professor/instructor may (i) issue a verbal reprimand, (ii) make an assignment of a lower grade with explanation, (iii) require additional academic assignments and issue a lower grade upon completion to the maximum grade “C”, (iv) make an automatic assignment of a failing grade, (v) recommend to the Chair dismissal from the course with the assignment of a failing grade. In order to protect students from inadvertent plagiarism, to protect the copyright of the material referenced, and to credit the author of the material, it is the policy of the department to employ a documentation format for referencing source material.

Student Portal:

The Sault College portal allows you to view all your student information in one place. **mysaultcollege** gives you personalized access to online resources seven days a week from your home or school computer. Single log-in access allows you to see your personal and financial information, timetable, grades, records of achievement, unofficial transcript, and outstanding obligations, in addition to announcements, news, academic calendar of events, class cancellations, your learning management system (LMS), and much more. Go to <https://my.saultcollege.ca>.

Electronic Devices in the Classroom:

Students who wish to use electronic devices in the classroom will seek permission of the faculty member before proceeding to record instruction. With the exception of issues related to accommodations of disability, the decision to approve or refuse the request is the responsibility of the faculty member. Recorded classroom instruction will be used only for personal use and will not be used for any other purpose. Recorded classroom instruction will be destroyed at the end of the course. To ensure this, the student is required to return all copies of recorded material to the faculty member by the last day of class in the semester. Where the use of an electronic device has been approved, the student agrees that materials recorded are for his/her use only, are not for distribution, and are the sole property of the College.

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 enclosed, the learning process has begun. Late arrivers will not be granted admission to the room.***

## **Class and Shop Conduct – Motive Power Policies and Procedures**

The Heavy Equipment Program considers both HED101 Theory and HED100 Shop to be *co-requisites*. Students must successfully complete both courses in the same semester.



### **Motive Power Department Truck/Coach-Heavy Equipment Department Policies and Procedures Policy Information Sheet**

- 1.** During your program, you are considered to be a member of the Motive Power Department. As such, your actions and department, both in the college and the community reflect on this Department. We trust that your influence will be positive.
- 2.** College policy prohibits the consumption of food and drink in the classrooms and shop. Smoking is allowed only outside of the building in designated smoking areas. **No smokeless tobacco is allowed in theory class or shop class.**
- 3.** CSA approved Safety Glasses and Safety Boots must be worn in the Shop at all times. This means going to and from all of the classrooms located in the shop. It is the responsibility of the **STUDENT** to wear them. You will be marked absent if the aforementioned policy is not adhered to.

**Note; All safety glasses and boots must meet Sault College CSA approval rating.**

See attachment RE: **Eye, Face and Foot Personal Protection Equipment (PPE)**

## **NO GLASSES-NO BOOTS-NO ENTRY!!**

- 4.** Repairs to your private vehicles in our facilities can be educational to you. We will accommodate you if the work is part of our program and schedules in. **No car should be parked in the shop compound without staff permission and a temporary parking pass clearly displayed.**

5. **Attendance** – if late, don't bother coming until the next class, you will be marked absent. The student is to be continuously present and actively participating during all scheduled theory and shop classes (scheduled breaks excepted). For every unexcused absence you will be deducted 1% per class period missed from that specific unit for the time missed.
6. The student must have safety boots and safety glasses readily available because you may not have a lot of warning when going into shop.
7. Please, coffee breaks only 10 to 12 minutes **MAXIMUM. NOTE: Individual Professors will address each class with their expectations. Some may only allow 10 minutes.**
8. Please refrain from loitering in "C" wing hallways, around shop hallway entry doors and outside entrance doorways/walkways.
9. Drinking alcohol at lunch is discouraged and students will be excused from class at the Professor's discretion.
10. Welding attendance is **MANDATORY, as are all related subjects.** It is in your best interests to attend all classes on your schedule. Remember, you need to successfully complete all assigned courses to graduate.
11. If you miss a test with an **"unexcused absence"** (as deemed legitimate by your professor) you will **NOT** be allowed to write that test. Only if; a doctors note, airline ticket, etc., or circumstances arising from a family emergency; and legitimate written proof can be presented to the professor. See item number 16 below for clarification.
12. If a class is missed or going to be missed it is your responsibility to notify in writing (see item #16 below) your Professor and make arrangements for handouts and notes taken while you are away.
13. **The use of cell phones/PDA's, electronic information/image capturing or recording device for any form of communication or recording (voice, text, recording, image, etc...) during theory class or shop is strictly prohibited. Cell phones/PDA's must be silenced during regular class and shop times and must be turned off and kept out of sight during test sittings. Failure to follow the latter requirement during a test sitting will result in a grade of 0 (zero) being assigned. NO EXCEPTIONS.**
14. Students may not wear earphones/headphones of any kind (i.e. for playback of recorded music/voice) during theory classes, shop classes and test sittings. This does not include hearing aids as required by hearing impaired students.

- 15.** **NO Lap Top Computers** will be allowed in any class unless proper documentation is provided that the computer is required for learning assistance.
- 16.** **Any request to deviate from the aforementioned course outline requirements must be made to the Professor in writing or via Sault College email. If permission is granted it must also be granted in writing or via Sault College email. Verbal requests/permissions are not acceptable. It is the student's responsibility to maintain a copy of all such requests and associated permissions.**

**Student Signature:** \_\_\_\_\_

**Date:** \_\_\_\_\_

**Students refusing to sign this form will not be allowed to register or continue in their course.**

## **Guideline For Truck/Coach-Heavy Equipment**

- 1. ATTENDANCE**  
A terminal objective of the Motive Power Department is the demonstration of satisfactory attendance and punctuality performance that the Motive Power Industry, itself, relies on, for efficiency, productivity and profitability.
- Absences will affect your learning and your final grade.
- 1.1 Students are encouraged to be present for the full duration of each class. Shop attendance is recorded at the start and end of class. Students are expected to be continuously present and actively participating (scheduled breaks excepted) for the entire class.
- 1.2 If you are absent from class at the time of attendance, you will be marked absent from the entire class.
- 1.3 If you are marked absent, and no reasonable excuse is given your absence will be termed unexcused. There should **NOT** be a reason to **NOT** let us know nor related subject Professors, in writing why you're absent.
- 1.4 Students will lose marks from their theory and shop mark grade for unexcused absences. Poor attendance can mean a repeat of both theory and shop courses if your employment skills are poor. This is based on the 10% Employability Skills.

- 1.5 At 10% of accumulated hours of unexcused absence you will be asked to a scheduled meeting with your Professor and will be asked to sign a contract enabling you to continue the course.
- 1.6 If you are absent from class, the lesson material is your responsibility.

## 2. **BEHAVIOR/ATTITUDE**

- 2.1 Students are required to:
- a) Properly care for and maintain all shop and classroom equipment.
  - b) Properly clean the shop/classroom facility and equipment at the end of each class.
  - c) Remain in the class during clean-up and assist in the cleaning and shutting down of their shop/classroom.
- 2.2 Students are expected to conduct themselves in a manner that does not interfere with or obstruct the overall learning environment.
- 2.3 The following activities are not allowed in the shop/classrooms:
- a) Horseplay.
  - b) Making unnecessary noise.
  - c) Swearing.
  - d) Abusive behavior.
  - e) Smoking, chewing smokeless tobacco, beverages and eating.

## 3. **ASSIGNMENTS AND THEORY TESTS**

- 3.1 Students are required to hand in assignments or write theory tests on the day and at the time specified/scheduled. See item #16 in the aforementioned document. You must attend 90% of the classes in a unit to be eligible to write the unit test.
- 3.2 Assignments will be graded as follows:
- a) One day after the original due date – 70% maximum.
  - b) Two or more days after the original due date – 50% maximum.

**NOTE:** The only exception of guideline 3 shall be those arising from personal emergencies (i.e. car accident, family death, serious illness, employment reasons) and the student supplies a written statement to that effect. See item #16 in the aforementioned document.

## 4. **SAFETY**

- 4.1 Students are required to wear their personal protective equipment (i.e. C.S.A approved safety boots and impact safety glasses) at all times while in the shop area. See attached addendum at the end of this document.
- 4.2 Students must not enter the shop area or commence work before their scheduled time.

- 4.3 Students must not work alone or in an unsupervised area.
- 4.4 Students must have lift truck training prior to operating those units.
- 4.5 Students must have equipment training and Technologist/Professor approval before operating any equipment.
- 4.6 Students must not use or operate equipment that is found to be unsafe or damaged. All such equipment must be reported to the Professor or Technologist who will replace and/or repair the said equipment.
- 4.7 Where damaged or unsafe equipment cannot be repaired or replaced, the Professor/Technologist will provide students alternate shop activity.
- 4.8 Students must follow instructions and safe work practices in order to use or operate any shop equipment.



**Student Assessment Procedure  
For  
Truck/Coach-Heavy Equipment  
THEORY**

Theory assessment is based on regularly scheduled tests and assignments. Attendance and home work checks are recorded and used as an aid for counseling. The following grades will be assigned:

A+	90 to 100 (Numerical Equivalent 4.00)	- Consistently Outstanding.
A	80 to 89 (Numerical Equivalent 4.00)	- Outstanding Achievement
B	70 to 79 (Numerical Equivalent 3.00)	- Consistently Above Average Achievement.
C	60 to 69 (Numerical Equivalent 2.00)	- Satisfactory or Acceptable Achievement.
D	50 to 59. (Numerical Equivalent 1.00)	- Acceptable when other marks average to a passing grade.
F (Fail)	49% and below.(Numerical equivalent 0:00)	- unacceptable performance.

CR – (Credit) Credit for diploma requirements has been awarded.

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 the Registrars office.

W – Student has withdrawn from the course without academic penalty.

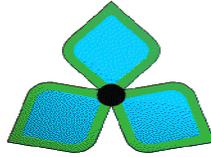
Your **Semester Theory Letter Grade** will be comprised of:

- 70% of Semester Theory Exam Average.
- 20% of Semester Theory Assignment Average.
- 10% of Assessed and Employability Skills (attendance, punctuality, attitude and work ethics)

A **60% Average of the total semester exam and assignments** must be achieved to receive a passing grade in Theory.

A student **cannot rewrite** a test to improve his/her mark.

If a test is missed by a student, without a good reason, an **“Incomplete”** grade is allotted.



## Student Assessment Procedure For Truck/Coach-Heavy Equipment SHOP

Shop assessment is based on two criteria:

1. 70% on project or shop assignments and on the students' ability as measured subjectively by performance on a variety of shop tasks. Such assignments or projects not received on time will be degraded accordingly.
2. 30% on employability skills. Attendance, punctuality, preparedness (safety boots, glasses, coveralls on and ready to work), house keeping, work organization and general attitude.

The following grades will be assigned:

A+	90 – 100% (Numerical Equivalent 4.00)	- Consistently Outstanding.
A	80 – 89% (Numerical Equivalent 4.00)	- Outstanding Achievement.
B	70 – 79% (Numerical Equivalent 3.00)	- Consistently Above Average Achievement.
C	60 – 69% (Numerical Equivalent 2.00)	- Satisfactory or Acceptable Achievement.
D	50 – 59% (Numerical Equivalent 1.00)	- Acceptable when other marks average to a passing grade.
F (Fail)	49% or below (Numerical Equivalent 0.00)	- Repeat – Objectives of course not achieved and course must be repeated.

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 the Registrars office.

W – Student has withdrawn from the course without academic penalty.



**Motive  
Power**

## **Eye, Face and Foot Personal Protection Equipment (PPE)**

Students are required to wear appropriate Personal Protection Equipment (PPE) in designated areas at all times. The designated areas for eye and foot protection in the Motive Power areas are: C1073 (Automotive), C1000, C1010, and C1040 (Truck/Coach and Heavy Equipment) and C1120 (Marine and Small Engines). Appropriate PPE must also be worn when facing hazards outside of these designated areas.

### **Eye Protection:**

**All protective eye wear shall meet the requirements of:**

**C.S.A. - Z94.3 or A.N.S.I. - Z87.1 +.**

**Approved safety glasses (lens and frames) shall have side protection such as wrap around design or fixed side shields.**

The minimum acceptable eye protection is a spectacle (class 1A on chart Z94.3). Dark tinted spectacles will not be accepted for general indoor use. Additional eye and face protection is required for specific hazards. Chart Z94.3 outlines the appropriate PPE for specific hazards.

### **Foot Protection:**

- 1. Boot height- minimum 5 ½" uppers (6" boot), measured from the top of the sole.**
- 2. Leather Construction.**
- 3. CSA Green Patch rating.**

Safety boots must be properly laced and not be worn or damaged as to impair their effectiveness.

## Eye and Face Protection Passport

Refer to the attached chart Z94.3 to identify the required eye and face protection for the following scenarios:

1. Minimum eye protection required at all times in a Motive Power area where signage indicates that eye protection must be worn.

Answer \_\_\_\_\_

2. Required eye protection for testing lead acid batteries where a chemical hazard exists.

Answer \_\_\_\_\_

3. Required eye protection for Oxyacetylene cutting and welding.

Answer \_\_\_\_\_

4. Required eye protection for sandblasting using portable equipment (no contained sand blasting cabinet).

Answer \_\_\_\_\_

5. Grinding, drilling or chipping.

Answer \_\_\_\_\_

I acknowledge that my Instructor has explained this policy, and I understand that it is my responsibility to wear the appropriate eye, face, and foot protection.

Signed \_\_\_\_\_

Print Name \_\_\_\_\_

Date \_\_\_\_\_

**Chart Z94.3**

**Selection of Eye and Face Protection**

**Note:** This table cannot cover all possible hazards and combinations that may occur. Examine each situation carefully and select the appropriate protector or combination of protectors.  
\*indicates recommended protection

	Spectacles (Class 1)			Goggles (Class 2)			Welding Helmet (Class 3)	Welding Hand Shield (Class 4)	Non-Rigid Hoods (Class 5)				Face Shields (Class 6)		
	A	B		A	B	C			A	B	C	D	A	B	C
<i>Flying Objects</i>															
Chipping, drilling, scaling, grinding, polishing, buffing, riveting, punching, shearing, hammer mills, crushing, heavy sawing, planing, wire and strip handling, hammering, unpacking, nailing, punch press, lathe work, etc.	*			*	*				*				*	*	
<i>Flying particles, dust, wind, etc.</i>															
Woodworking, sanding, light metal working and machining, exposure to dust and wind, resistance welding (no radiation exposure), sand, cement, aggregate handling, painting, concrete work, plastering, material batching and mixing	*			*	*				*				*	*	
<i>Heat, sparks and splash from molten materials</i>															
Babbiting, casting, pouring molten metal, brazing, soldering, spot welding, stud welding, hot dipping operations		*				*									
<i>Acid splash, chemical burns</i>															
Acid and alkali handling, degreasing, pickling and plating operations, glass breakage, chemical spray, liquid bitumen handling						*			*					*	
<i>Abrasive blasting materials</i>															
Sand blasting, shot blasting, shotcreting					*				*						*
<i>Glare, stray light (for reduction of visible radiation)</i>															
Reflecting, bright sun and lights, reflected welding flash, photographic copying	*			*	*				*				*	*	
<i>Injurious optical radiation (moderate reduction of optical radiation)</i>															
Torch cutting, welding, brazing, furnace work, metal pouring, spot welding, photographic copying															
<i>Injurious optical radiation (large reduction of optical radiation)</i>															
Electric arc welding, heavy gas cutting, plasma spraying and cutting, inert gas shielded arc welding, atomic hydrogen welding							*	*							

