

I. COURSE DESCRIPTION:

HED111 will compliment diesel engine theory taken in the first semester, as well as add, cooling and lubrication systems, exhaust, turbocharging and aftercooling, air induction systems, as well as the various drive train components encountered in heavy duty and truck / coach power trains. Truck and trailer coupling devices, Electrical Fundamentals and Information Technology will be studied as well. Safety elements of the repair industry will be stressed. Skills learned in this semester can be applied to the construction, material handling, mining, forestry, equipment rental, and transportation industries.

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, fundamentals and principles of electricity**Potential Elements of the Performance:**

Describe:

- Atomic structure
- Conductors and insulators
- Magnetism
- Electron and conventional theories
- Sources of electricity
- Ohm's Law, Kirchhoff's Law, Watts Law
- Current flow, heat and resistance
- Magnetism
- Systems International (S.I.) System
- Voltage
- Amperage
- resistance
- Wattage
- Series, Parallel and series parallel circuit
-

Perform basic electrical repairs**Potential Elements of the Performance:**

- Cleaning
- Splicing
- Crimping
- Soldering
- Corrosion protection
- Weather proofing
- Terminal repair

Identify, inspect, and test basic electrical components and systems in compliance with manufacturers' recommendations.

Potential Elements of the Performance:

- Inspect , test, service and replace batteries adhering to safe working procedures
- Identify circuit components and test circuit protection devices
- Demonstrate the ability to measure voltage, current and resistance using a DVOM (digital volt ohm meter)
- Perform maintenance on a DVOM including testing and replacing internal circuit protection and batteries

Describe the construction, operation, types, styles and application of electromagnetic devices.

Potential Elements of the Performance:

Describe the fundamentals of:

- power generation
 - alternators
 - generators
- electric motors
- solenoids
- relays
- coils
- stepper motors
- switches

2. *Recognize the various engine lubrication components and understand their operating principles and maintenance requirements.*

Potential Elements of the Performance:

- Identify lube pump type and operating fundamentals.
- Recognize the where and why of safety valves, pressure regulating valves, by-pass valves, and priority circuits.
- Identify and understand the maintenance procedures for full-flow and partial flow filters, and centrifugal devices.
- Identify the various types and location of oil coolers.
- Recognize lubrication API and SAE ratings and their purpose.
-

3. *Support the heavy equipment and truck maintenance industries by recognizing components and identifying the correct cooling system analysis, maintenance and preventive maintenance procedures.*

Potential Elements of the Performance:

- Recognize radiators, rad caps, water pumps, seals, heat exchangers, thermostatic controls, fans, fan drives, and shutters, and the proper diagnostics and maintenance, repair or replacement of those components.
- Ensure air cooled engine and heat exchanger systems are in working order and maintained.

4. Evaluate and maintain the various air induction and exhaust systems in the heavy equipment and truck industries.

Potential Elements of the Performance:

- Identify inspect and maintain air pre-cleaners, single and multi-stage air filters, mechanical blowers, turbochargers and after coolers.
- Measure and assess air restriction, exhaust back pressure and crankcase blow-by accurately and safely.

5. Diagnose and recommend repair and maintenance procedures for heavy equipment and truck related drive train components.

Potential Elements of the Performance:

- Identify and understand the operating fundamentals and adjustment and repair/replacement procedures for push release, pull release and over centered clutches.
- Calculate simple and compound gear train speed outcomes and ratio.
- Recognize the various gear set advantages, and special lubricants and maintenance procedures.
- Follow power flows through single and multi-countershaft manual transmissions, recognize shifter mechanisms and safety devices such as detents and interlocks.
- Recognize torque convertor construction and operation.
- Follow torque flow through countershaft and planetary powershift transmissions.
- Identify various universal joints, their construction and operation, phasing and angle requirements.
- Recognize construction and purpose and operating principles of single and double reduction differentials, interaxle differentials, limited slip, differential locks and torque proportioning differentials.
- Identify and understand reduction final drives including planetary, pinion-bull gear, and chain type.

6. Support the truck transportation maintenance and repair industry by identifying and recommending the proper replacement / repair / or maintenance of coupling pintle and fifth wheel assemblies.

Potential Elements of the Performance:

- Identify and understand the operating principles of fifth wheel and pintle hook coupling devices, their inherent wear points and the accurate testing and assessment of these vital components.

7. This course is designed to provide the successful student with the computer skills required to access trade related electronic service information, process information effectively, communicate on the web and produce documentation. Students will be introduced to a variety of software applications commonly utilized in the Motive Power Industry. Fundamental personal computer components and operation will be covered.

Use information technology and computer skills to access data concerning repair procedures and manufacturers' updates.Potential Elements of the Performance:

- Use computer hardware and applications to access, exchange, store, retrieve, process, organize, and present repair information and produce technical documents.
- Research OEM and aftermarket service information.
- Use a variety of search engines to find manufacturers' service bulletins and updates

Prepare logs, records, and documentation to appropriate standards.Potential Elements of the Performance:

- Prepare technical documentation such as maintenance schedules.
- interpret and use information from technical manuals
- prepare installation records
- document the testing of equipment and systems
- edit a work order
- contribute to recording inventory

Computer FundamentalsPotential Elements of the Performance:

- Identify components in a personal computer
- Identify commonly used file extensions

Cut, copy and paste commands

III. TOPICS:

1. Electrical Fundamentals
2. Engine Lubrication Systems
 - Lubricants
3. Engine Cooling Systems
 - Air
 - Liquid
4. Engine Air Induction and Exhaust Systems
5. Drive Trains
 - Clutches
 - Gears
 - Manual Transmissions
 - Drive Lines
 - Differentials
 - Final Drives
6. Information Technology

IV. REQUIRED RESOURCES/TEXTS/MATERIALS:

Heavy Duty Truck Systems 4th Edition (Thomson Delmar)
 Diesel Technology (Nelson Thompson)
 Diesel Technology Workbook
 Vickers Mobile Hydraulics Manual
 Power Trains (John Deere)
 Pens, pencils, coloured pencils, calculator, and 3-ring binder

V. EVALUATION PROCESS/GRADING SYSTEM:

The Truck and Coach / Heavy Duty Equipment Technician program considers both HED 111 Theory and HED 110 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 exam average
- 20% of semester theory assignment average
- 10% of assessed employability skills (attendance, punctuality, work ethics, and attitude)

A **60% Average of the total semester exam, assignments and employability skills** must be achieved to receive a passing grade of at least C 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.

The following **SEMESTER GRADES** will be assigned to students:

Grade	<u>Definition</u>	<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.	



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

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 for Theory Assignments:

A+	90 to 100
A	85
A-	80
B +	79
B	75
B-	70
C +	69
C	65
C-	60
D	50
F (Fail)	49 or less.

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.

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 HED110-10 Theory and HED111-9 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 deportment, 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 or using drugs at lunch or any time during school hours 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 all classes and test sittings. Failure to follow the latter requirement during a test sitting will result in a grade of 0 (zero) being assigned and if not out of sight or being used during class, the unit WILL be confiscated for the duration of the class.
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 students 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.



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							*	*							

