

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:

Grade	Definition	<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 Failure – the student has not achieved the objectives of the course and the 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 Registrar's office.	
W	Student has withdrawn from the course without academic penalty.	

VI. SPECIAL NOTES:Special Needs:

If you are a student with special needs (e.g. physical limitations, visual impairments, hearing impairments, or learning disabilities), you are encouraged to discuss required accommodations with your professor and/or the Special Needs office. Visit Room E1101 or call Extension 703 so that support services can be arranged for you.

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.

Plagiarism:

Students should refer to the definition of “academic dishonesty” in *Student Rights and Responsibilities*. Students who engage in “academic dishonesty” will receive an automatic failure for that submission and/or such other penalty, up to and including expulsion from the course/program, as may be decided by the professor/dean. 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.

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.

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

VII. PRIOR LEARNING ASSESSMENT:

Students who wish to apply for advanced credit in the course should consult the professor. Credit for prior learning will be given upon successful completion of a challenge exam or portfolio.

VIII. DIRECT CREDIT TRANSFERS:

Students who wish to apply for direct credit transfer (advanced standing) should obtain a direct credit transfer form from the Dean’s secretary. Students will be required to provide a transcript and course outline related to the course in question.