

SAULT COLLEGE OF APPLIED ARTS AND TECHNOLOGY

SAULT STE. MARIE, ONTARIO



Sault College

COURSE OUTLINE

COURSE TITLE: Heavy Equipment II Shop
CODE NO. : HED 110-9 **SEMESTER:** 2
PROGRAM: Truck & Coach / Heavy Duty Equipment Technician
AUTHOR: Jack Bowes
DATE: Jan/2008 **PREVIOUS OUTLINE DATED:** Jan/07
APPROVED:

| | <hr/> | CHAIR | <hr/> | DATE |
|-------------------------|------------------|--------------|-------|-------------|
| TOTAL CREDITS: | 9 | | | |
| PREREQUISITE(S): | HED 100, HED 101 | | | |
| HOURS/WEEK: | 6 Hours | | | |

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For additional information, please contact Corey Meunier, Chair
School of the Natural Environment, Technology & Skilled Trades
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I. COURSE DESCRIPTION:

This hands-on shop course compliments and reinforces the theory taken in HED 111 during the winter semester. The student is required to perform a wide variety of shop assignments and projects that will later assist the graduate in trade related employment in the heavy equipment and trucking industries. The course covers diesel engine cylinder head reconditioning, engine dynamometer testing, exhaust and air induction maintenance, complete powertrain coverage, and truck related coupling systems.

II. LEARNING OUTCOMES AND ELEMENTS OF THE PERFORMANCE:

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

1. Adjust, maintain and repair diesel engine cylinder heads in the truck and heavy equipment industries.
Potential Elements of the Performance:
 - Remove, disassemble and recondition cylinder head assemblies.
 - Assess and adjust top ends (tune-ups) on two and four stroke diesel engines.
2. Perform preventive maintenance tasks in lube and oil change requirements in the truck and heavy equipment fields.
Potential Elements of the Performance:
 - Understand SAE and API lubricant designation and application
 - Recognize and maintain full flow and partial flow oil filtration systems including centrifuge types.
 - Inspect and assess individual lubrication system components with in a typical diesel engine.
3. Inspect and assess the maintenance required for diesel engine cooling systems.
Potential Elements of the Performance:
 - Test pressure and sealing of radiator caps.
 - Inspect water pump sealing and bearing condition.
 - Test thermostat cracking and full opening temperatures.
 - Inspect and test mechanical, viscous and pneumatic fan drives, their controllers and temperature sensors and gauges.
 - Inspect and test radiator shutters, their controls and operation.
 - Perform engine coolant/antifreeze tests for freeze protection and chemical balance.
4. Maintain and perform preventive maintenance on a variety of diesel engine air induction and exhaust system components including air blowers and turbochargers and after/inter coolers.

Potential Elements of the Performance:

- Measure air restriction and exhaust back pressure with water and mercury manometers.
 - Inspect and test turbocharged engine locking and gauge air restriction indicators.
 - Inspect and clean air precleaners, inspect and change single, two and three stage air filters and safety elements.
 - Check turbocharger shafts and housings for proper tolerances and inspect for possible oil seal damage at exhaust and induction outlets.
5. Prepare and safely start up and perform engine performance checks on a water brake dynamometer.

Potential Elements of the Performance:

- Load engine, measure and record horsepower readings at various r.p.m.
 - Measure and record torque performance at various r.p.m.
 - Measure exhaust, charge air, oil and coolant temperatures with an infrared tool, and record data.
6. Perform inspection, tests and adjustments, disassemble, inspect and assemble a wide variety of heavy equipment and truck related drive train components.

Potential Elements of the Performance:

- Dismantle, inspect and assemble push release, pull release and overcentered clutch assemblies, and adjust for proper freeplay or engagement force.
- Identify the powerflow through a manual transmission.
- Identify transmission type, detent and interlock construction and operation.
- Disassemble and inspect dry and wet sump torque convertors.
- Disassemble and inspect countershaft and planetary powershift transmissions.
- Measure and record driveshaft working angles, remove and replace universal joints, and phase driveline.
- Disassemble, inspect and assemble a single reduction axle differential with proper quill and pinion preload and backlash, as well as check tooth contact pattern.
- Dismantle, check condition and reassemble double reduction and two speed differentials.
- Disassemble, inspect and assemble an interaxle differential including lockout.
- Remove, inspect and reassemble single and double reduction planetary final drives and recommend proper lube levels.
- Inspect and grease all grease points on a combination truck and trailer, and check all fluid and fluid lubricant levels.

7. Perform inspections and tests of highway tractor coupling devices.
Potential Elements of the Performance:

- Test fifth wheel and pintle towing hook operation and wear.
- Inspect, test and adjust fifth wheel to new trailer king pin.

TOPICS:

III.

1. Engine Cylinder Head Repair and Top-end Tune-ups
2. Engine Lubrication Systems
3. Engine Cooling Systems
4. Engine Air Induction and Exhaust Systems
5. Engine Performance Testing
6. Heavy Equipment and Truck Drive Trains
7. Coupling Devices

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)
Pen, Pencil
Safety Work Boots (CSA approved – high cut)
Safety Glasses (CSA approved and impact resistant)
Coveralls (non flammable material – i.e. cotton)

V. EVALUATION PROCESS/GRADING SYSTEM:

The Truck and Coach / Heavy Duty Equipment Technician program considers both HED 110-9 Shop and HED 111-10 Theory to be co-requisites. Students must successfully complete both courses in the same semester.

For HED 110 Shop, letter grades are based on:

- 70% on project and shop assignments and on the student's ability as measured subjectively by performance on a variety of shop tasks.
- 30% on employability skills; attendance, punctuality, preparedness, housekeeping, work organization, and general attitude.

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 | |
| | 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.