

I. COURSE DESCRIPTION:

In this course the student will be able to describe the construction, basic operating principles, servicing and testing techniques of the following gear train systems, clutch assemblies, manual transmission, differentials, rear wheel drive, drive shafts and PTO shafts and rear wheel drive axle, wheel and hub assemblies. The student will also demonstrate their ability to disassemble, test and inspect manual transmissions, differentials, wheel hubs and drivelines including backlash, preload, gear patterns, driveline angle measurement and phasing.

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. *Explain the construction, operating principles, testing and service techniques required to repair single and double disc clutch assemblies.*

Potential Elements of the Performance:

- Compare & contrast static and sliding friction.
- State the effects of centrifugal force.
- Describe the construction of single and double disc push and pull type clutch assemblies.
- Test and inspect push and pull type clutch assemblies with prescribed service tools and equipment.
- Perform clutch adjustments following manufactures maintenance procedures.

2. *Demonstrate a thorough understanding of the construction, operation, testing and servicing of rear wheel drive single countershaft manual transmissions.*

Potential Elements of the Performance:

- Describe the basic operating principles of various manual shift gear boxes.
- Discuss the common customer complaints related to various power train component failures.
- Dismantle and trace power flows in manual shift transmissions.
- Inspect gears and synchronizers for wear and proper operation.
- Describe manufacturers' system maintenance procedures of manual transmission lubricating fluids.

3. Describe the function, composition and construction of single reduction differentials and drive shafts.

Potential Elements of the Performance:

- Identify the differential and drive axle assemblies employed within the motive power field.
- Describe the function and interrelationship of the components of differentials and drive axle assemblies.
- Measure driveline angle and phasing using prescribed tools and equipment.
- Compare and contrast gears used in motive power drivelines (e.g.) bevel gear, spur gear, helical and hypoid.

4. Explain the fundamentals, construction, composition and types of wheel hub assemblies.

Potential Elements of the Performance:

- Explain sliding and rolling friction.
- Outline load carrying bearings.
- Describe the importance of proper fluid types and specified levels.
- Identify bearing types, tapered roller and ball bearing.
- Describe seals and seal types used.

5. Perform removal, installation and inspection of wheel hub assemblies.

Potential Elements of the Performance:

- Remove and install a wheel hub assembly following manufacturer's recommendations.
- Inspect bearing match, endplay, bearing fit and hub & spindle condition.
- Adjust bearing preload / endplay following *TMC and OEM procedures.
*Technical and maintenance council (TMC)

III. TOPICS:

1. Clutches.
2. Manual transmissions.
3. Differentials and drive shafts.
4. Wheel hubs.
5. Inspection and adjustment of wheel hubs.

IV. REQUIRED RESOURCES/TEXTS/MATERIALS:**Title:** Heavy Duty Truck Systems**Edition:** 4th ed., 12959#**Author:** Bennett**Publisher:** Thomson Nelson Learning Canada**Title:** Automotive Technology: A Systems Approach/AST Test Prep**Edition:** 06 ed., 17810#**Author:** Erjavec**Publisher:** Thomson Nelson Learning Canada

Pen, pencils, calculator, and 3-ring binder

The following items are mandatory for entrance to the Shop:

- CSA approved steel toe boots (high top)
- CSA approved safety glasses
- Approved coveralls

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 – 35% of the final grade is comprised of term tests
- Assignments – 10% of the final grade is comprised of a number of technical reports
- Shop – 45% of the final grade is comprised of attendance, punctuality, preparedness, student ability, work organization and general attitude
- Employability Skills – 10% of final grade is comprised of attendance, class participation, show ability to follow direction and being a team player.

(Student will be given notice of test and assignment dates in advance)

NOTE: All assignments will be in typed format. NO hand written assignments will be accepted.

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%	

F (Fail)	49% and below	0.00
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:

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.

NO CELL PHONES OR LAP TOP COMPUTERS OR ANY ELECTRONIC DEVICES ALLOWED IN THE CLASSROOM.

VII. COURSE OUTLINE ADDENDUM:

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