



**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 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.

**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

**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 – 40% of the final grade is comprised of term tests
- Assignments – 10% of the final grade is comprised of a number of technical reports
- Shop – 50% of the final grade is comprised of attendance, punctuality, preparedness, student ability, work organization and general attitude

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

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:

### 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.



**Professor Tregonning's  
Student Assessment Procedure  
For  
Motive Power**

**THEORY ASSIGNMENTS and REPORTS**

Theory assessment is based on regularly scheduled tests and assignments and final exam. Attendance and home work checks are recorded and used as an aid for counseling.

The following grades will be assigned for **Theory Assignments and Reports:**

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.
- c) Three days after the original due date will **NOT** be accepted.



### **Professor Tregonning's Motive Power Program Policies and Procedures**

1. During your program, you are considered to be a member of the Motive Power Department. As such, your actions and behavior, 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.**

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

### **4. SAFETY**

- 4.1 Students must not enter the shop area or commence work before their scheduled time.
- 4.2 Students must not work alone or in an unsupervised area.
- 4.3 Students must have lift truck training prior to operating those units.
- 4.4 Students must have equipment training and Technologist/Professor approval before operating any equipment.
- 4.5 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.

- 4.6 Where damaged or unsafe equipment cannot be repaired or replaced, the Professor/Technologist will provide students alternate shop activity.
  - 4.7 Students must follow instructions and safe work practices in order to use or operate any shop equipment.
5. 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 or outside a shop door without staff permission and a temporary parking pass clearly displayed.**
6. **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).
- 6.1 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.
  - 6.2 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 or by telephone why you're absent.
  - 6.3 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 what is considered: Employability Skills.
  - 6.4 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.
  - 6.5 If you are absent from class, the lesson material is your responsibility.
7. **BEHAVIOR/ATTITUDE**
- 7.1 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.



- 7.2** Students are expected to conduct themselves in a manner that does not interfere with or obstruct the overall learning environment.
- 7.3** 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.

## **8. ASSIGNMENTS AND THEORY TESTS**

- 8.1** Students are required to hand in assignments or write theory tests on the day and at the time specified/scheduled. See item #18 below.
- 8.2** Assignments will be graded as follows:
- a) One day after the original due date – 70% maximum.
  - b) Two days after the original due date – 50% maximum.
  - c) Three days after the original due date will **NOT** be accepted.

**NOTE:** The only exception of Policy # 8 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 #18 below.

- 9.** 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.**
- 10.** Please refrain from loitering in “C” wing hallways, around shop hallway entry doors and outside entrance doorways/walkways.
- 11.** Being under the influence of alcohol or drugs during any shop or theory class will not be tolerated and the student will be excused from class at the Professor’s discretion.
- 12.** Please remember that you must attend all related subject areas and pass successfully to obtain a Certificate or Diploma.

- 13.** 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 doctor’s note, airline ticket, etc., or circumstances arising from a family emergency; and legitimate written proof can be presented to the professor. See item number 18 below for clarification.
- 14.** If a class is missed or going to be missed it is your responsibility to notify in writing (see item #18 below) your Professor and make arrangements for handouts and notes taken while you are away.
- 15.** The use of Lap Tops, cell phones/PDA’s, electronic information/image capturing, 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 and/or you may be removed from class.**  
**NO EXCEPTIONS**
- 16.** 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.
- 17.** **NO Lap Top Computers** will be allowed in any class unless proper documentation is provided that the computer is required for learning assistance.
- 18.** 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.