



## COURSE OUTLINE: CVC616 - DRIVE TRAIN SYSTEMS

Prepared: John Avery

Approved: Corey Meunier, Chair, Technology and Skilled Trades

<b>Course Code: Title</b>	CVC616: DRIVE TRAIN SYSTEMS
<b>Program Number: Name</b>	6080: COMM VEHICLE-COMMON
<b>Department:</b>	MOTIVE POWER APPRENTICESHIP
<b>Semesters/Terms:</b>	18F
<b>Course Description:</b>	Drive Train Systems is designed to provide the proper maintenance and repair procedures for students working on Commercial Vehicles and Equipment. On this course students will learn about the different types of drive trains used the components that make up the drive train of various types of vehicles and equipment and their proper maintenance and repair procedures. Students will be taught how to safely and properly diagnose, disassemble, re-assemble and repair or replace clutches and clutch components, transmissions and components, drive shaft components and single reduction drive axle assemblies and components according to Manufacturer Specifications.
<b>Total Credits:</b>	4
<b>Hours/Week:</b>	0
<b>Total Hours:</b>	32
<b>Prerequisites:</b>	There are no pre-requisites for this course.
<b>Corequisites:</b>	There are no co-requisites for this course.
<b>Essential Employability Skills (EES) addressed in this course:</b>	EES 1 Communicate clearly, concisely and correctly in the written, spoken, and visual form that fulfills the purpose and meets the needs of the audience. EES 2 Respond to written, spoken, or visual messages in a manner that ensures effective communication. EES 3 Execute mathematical operations accurately. EES 4 Apply a systematic approach to solve problems. EES 5 Use a variety of thinking skills to anticipate and solve problems. EES 6 Locate, select, organize, and document information using appropriate technology and information systems. EES 7 Analyze, evaluate, and apply relevant information from a variety of sources. EES 8 Show respect for the diverse opinions, values, belief systems, and contributions of others. EES 9 Interact with others in groups or teams that contribute to effective working relationships and the achievement of goals. EES 10 Manage the use of time and other resources to complete projects. EES 11 Take responsibility for ones own actions, decisions, and consequences.
<b>Course Evaluation:</b>	Passing Grade: 50%, D
<b>Other Course Evaluation &amp; Assessment Requirements:</b>	Theory 50% Shop Practical 30% Assignments 20%



SAULT COLLEGE | 443 NORTHERN AVENUE | SAULT STE. MARIE, ON P6B 4J3, CANADA | 705-759-2554

Grade  
 Definition Grade Point Equivalent  
 A+ 90 - 100% 4.00  
 A 80 - 89%  
 B 70 - 79% 3.00  
 C 60 - 69% 2.00  
 D 50 - 59% 1.00  
 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.

**Books and Required Resources:**

Heavy Duty Truck Systems by Bennett  
 Publisher: Cengage Edition: 6th

**Course Outcomes and Learning Objectives:**

Course Outcome 1	Learning Objectives for Course Outcome 1
<p>Upon successful completion, the apprentice is able to recommend repairs to single countershaft manual transmissions following manufacturers' recommendations.            Recommend repairs to push-type clutch and flywheel assemblies following manufacturers' recommendations.            Explain the fundamentals of gearing used in drive train systems.            Recommend repair to drive shafts, power take-off shafts, safety shields and universal joints following manufacturers' procedures.            Recommend repairs to single reduction drive axle assemblies following manufacturers' recommendations.</p>	<p>Upon successful completion, the apprentice is able to:</p> <p>6.2.1 Explain the purpose and fundamentals of gears and related support assemblies.            [2/0]            - mechanical advantage            - laws of levers            - torque            - input/output ratio speed            - gear ratio            - shafts, splines, and gears            - lubrication</p> <p>6.2.2 Identify the construction features, composition, types, and application of gears and related support assemblies.            [2/0]            - clutching mechanisms            - case            - gears            - shafts            - bearings and bushings            - spacers and thrust washers            - seals and gaskets            - shifting mechanisms</p> <p>Upon successful completion, the apprentice is able to:</p> <p>6.4.1 Explain the fundamentals of drive shafts, power take-off shafts, safety shields and universal joints.            [1/0]</p>



- angularity
- articulation
- telescoping
- theory of non-uniform velocity
- parallel drive line arrangements
- broken-back drive line arrangements
- parallelogram
- working angle calculations
- equal angle hitch geometry(eg. Agricultural drawn equipment)
- shielding requirements
- PTO (power take off) adapters

6.4.2 Identify the construction features, composition, types, and application of drive shafts, power take-off shafts, safety shields and universal joints.

[1/0]

- drive shaft classification
- drive shaft load ratings
- drive shaft speed ratings
- hanger bearings
- slip splines
- carden joints
- trunnion
- bearings
- flanges and yokes
- shielding requirements
- PTO (power take off) adapters

6.4.3 Describe the principles of operation of drive shafts, power take-off shafts, safety shields and universal joints.

[2/0]

- shafts and cardan joints
- angularity
- velocity
- phasing
- balancing
- run-out
- torsional loading
- vibration

6.4.4 Perform the inspection, testing, and diagnostic procedures following manufacturers' recommendations of drive shafts, power take-off shafts, safety shields and universal joints.

[0/1]

- demonstration of:
- inspection techniques (wear/damage)
- noise analysis
- evaluating drive line vibration
- determining universal joint working angles
- failure analysis for:
- torsional vibration



- excessive angularity
- operational overloading
- seized slip-joint
- shock failures
- fatigue failures

6.4.5 Recommend reconditioning or repairs following manufacturers' procedures of drive shafts, power take-off shafts, safety shields and universal joints.

[0/1]

- demonstrate:

- lubricating a universal joint and slip-spline assembly
- replacing a cardan joint
- replacing a centre hanger bearing assembly
- measuring slip-spline wear
- correcting component working angles

Upon successful completion, the apprentice is able to:

6.5.1 Explain the purpose and fundamentals of single reduction drive axle assemblies.

[1/0]

- mechanical advantage
- laws of levers
- torque
- input/output ratio speed
- gear ratios
- loading characteristics
- differential action
- thrust loads
- power flow
- bearing preloads
- lubrication
- engagement mechanisms

6.5.2 Identify the construction features, composition, types, and application of single reduction drive axle assemblies.

[1/0]

- drive axle assembly
- housings
- carriers
- removable
- integral
- drive gear sets (crown and pinion)
- spiral bevel
- hypoid
- amboid
- differential gearing
- Axleshafts

6.2.3 Describe the principles of operation of gears and related support assemblies.

[2/0]

- clutching mechanisms
- gears



- matching
- timing
- shafts
- power flow
- lubrication circuits
- thrust control
- bearings and bushings
- sealing
- shifting mechanisms

Upon successful completion, the apprentice is able to:  
 6.3.1 Explain the purpose and fundamentals of single countershaft manual transmissions.

[1/0]

- mechanical advantage
- laws of levers
- torque
- input/output ratio speed
- gear ratio
- shafts, splines, and gears
- lubrication

6.3.2 Identify the construction, composition, types, and application of single countershaft manual transmissions.

[1/0]

- clutching mechanisms
- synchronizers
- case
- gears
- shafts
- bearings and bushings
- spacers and thrust washers
- seals and gaskets
- shifting mechanisms

6.3.3 Describe the principles of operation of gears and related support assemblies.

[3/0]

- clutching mechanisms
- synchronizers
- gears
- matching
- timing
- shafts
- power flow
- lubrication circuits
- thrust control
- bearings and bushings
- sealing
- shifting mechanisms

6.3.4 Perform the inspection, testing, and diagnostic procedures following manufacturers' recommendations on single countershaft manual



transmissions.

[0/2]

- demonstrate:
- visual inspection
- performance testing
- thrust measurement
- checking fluid level and condition
- verify power flow
- failure analysis for:
- shock failures
- fatigue failures
- torsional failures
- surface failures

6.3.5 Recommend reconditioning or repairs following manufacturers' procedures on single countershaft manual transmissions.

[1/0]

- outline procedure for checking lubricant levels
- recommended lubricant change intervals and procedures
- identify lubricant types and application
- outline procedure for transmission removal, disassembly, reassembly and replacement - semi-floating
- full floating

6.5.3 Describe the principles of operation of single reduction drive axle assemblies.

[2/0]

- drive axle assembly
- carriers
- removable
- integral
- drive gear sets (crown and pinion)
- spiral
- hypoid
- amboid
- differential gearing
- axle shafts
- semi-floating
- full floating
- lubrication
- lubricants
- noise and temperature analysis

6.5.4 Perform inspection, testing, and diagnostic procedures following manufacturers' recommendations of single reduction drive axle assemblies.

[0/1]

- demonstrate:
- lubricant level and condition checks
- backlash measurement
- pattern check

6.5.5 Recommend reconditioning or repairs following



manufacturers` procedures of single reduction drive axle assemblies.  
 [0/1]  
 - demonstrate:  
 - lubricant change procedures  
 - identifying lubricant type and application  
 - carrier removal, disassembly, reassembly, and replacement procedure  
 - procedure for adjusting:  
 - pinion bearing preload  
 - pinion depth  
 - carrier bearing preload  
 - drive gear set backlash  
 - procedure for checking:  
 - drive gear set contact pattern  
 - drive gear set backlash  
 - thrust block adjustment

**Evaluation Process and Grading System:**

Evaluation Type	Evaluation Weight	Course Outcome Assessed
assignments	20%	
Shop Practical	30%	
Theory	50%	

**Date:**

August 28, 2018

Please refer to the course outline addendum on the Learning Management System for further information.

