



## COURSE OUTLINE: AST614 - DRIVE TRAIN SYSTEMS

Prepared: Stephen Kent

Approved: Corey Meunier, Chair, Technology and Skilled Trades

<b>Course Code: Title</b>	AST614: DRIVE TRAIN SYSTEMS
<b>Program Number: Name</b>	
<b>Department:</b>	MOTIVE POWER APPRENTICESHIP
<b>Semesters/Terms:</b>	21F, 22W, 22F
<b>Course Description:</b>	<p>In this course the student will be able to describe the construction, basic operating principles, servicing and testing techniques of the following drive train systems, clutch assemblies, manual transmission and manual transaxles. The student will also demonstrate their ability to disassemble, test and inspect manual transmissions / transaxles and clutches.</p> <p>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.</p>
<b>Total Credits:</b>	5
<b>Hours/Week:</b>	0
<b>Total Hours:</b>	36
<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>	<p>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.</p> <p>EES 2 Respond to written, spoken, or visual messages in a manner that ensures effective communication.</p> <p>EES 3 Execute mathematical operations accurately.</p> <p>EES 4 Apply a systematic approach to solve problems.</p> <p>EES 5 Use a variety of thinking skills to anticipate and solve problems.</p> <p>EES 6 Locate, select, organize, and document information using appropriate technology and information systems.</p> <p>EES 7 Analyze, evaluate, and apply relevant information from a variety of sources.</p> <p>EES 8 Show respect for the diverse opinions, values, belief systems, and contributions of others.</p> <p>EES 9 Interact with others in groups or teams that contribute to effective working relationships and the achievement of goals.</p> <p>EES 10 Manage the use of time and other resources to complete projects.</p> <p>EES 11 Take responsibility for ones own actions, decisions, and consequences.</p>
<b>Course Evaluation:</b>	Passing Grade: 50%, D

In response to public health requirements pertaining to the COVID19 pandemic, course delivery and assessment traditionally delivered in-class, may occur remotely either in whole or in part in the 2021-2022 academic year.



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A minimum program GPA of 2.0 or higher where program specific standards exist is required for graduation.

**Other Course Evaluation & Assessment Requirements:** 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 70% of the final grade is comprised of term tests  
 Shop 30% of the final grade is comprised of attendance, punctuality, preparedness, student ability, work organization and general attitude

Students will be given notice of test and assignment dates in advance

**Books and Required Resources:** Automotive Technology: A Systems Approach by Erjavec  
 Publisher: Thomson Nelson Learning Canada Edition: 4th Canadian

<b>Course Outcomes and Learning Objectives:</b>	<b>Course Outcome 1</b>	<b>Learning Objectives for Course Outcome 1</b>
	Upon successful completion of this course, the student will demonstrate the ability to:	1.1 Explain the basic fundamentals of clutch assemblies. clamping force centrifugal force mechanical advantage hydraulic advantage static and sliding friction co-efficient of friction friction and heat inertia  1.2 Identify the specific components of dry disc clutch assemblies. dry disc clutch assemblies flywheel / ring gear pressure plate clutch friction disc and hub assembly input shaft pilot bearing / bushing release bearing mechanical release mechanisms hydraulic release mechanisms clutch housings clutch control systems safety switch  1.3 Describe the operation of clutches assemblies. disengagement and engagement single and dual disc clutches wave / cushion spring hub / torsional springs semi-centrifugal clutches flywheel / ring gear pressure plate power flow

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	<p>pilot bushing / bearing clutch control systems safety switch</p> <p>1.4 Perform inspection, diagnostics and troubleshooting procedures on clutch assemblies. perform visual / functional inspection fly wheel ring gear clutch disc pressure plate clutch and housing alignment clutch control system safety switch</p> <p>1.5 Explain repair operations on clutch assemblies. familiarization with manufacturers service procedures clutch adjustment clutch overhaul procedures machining practices failure analysis lubrication practices fluid levels verify the repair operations</p>
<b>Course Outcome 2</b>	<b>Learning Objectives for Course Outcome 2</b>
Basic gear theory and operation	<p>2.1 Explain the basic fundamentals of gears. mechanical advantage laws of levers as applied to gears torque vs speed input / output rotational speed gear ratios shafts, splines and gears</p> <p>2.2 Identify the specific characteristics of gears. gear nomenclature gear types simple, compound, and idler gear trains gear ratio calculations shafts bearings and bushings spacers and thrust washers</p> <p>2.3 Describe the operation of gears. gears timing shafts power flow thrust control bearings and bushings</p>
<b>Course Outcome 3</b>	<b>Learning Objectives for Course Outcome 3</b>
Describe the operation of	3.1 Explain the basic fundamentals of manual transmissions /

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	<p>manual transmissions / transaxles according to manufacturers standards.</p>	<p>transaxles. purpose functions types sliding selective constant mesh applications</p> <p>3.2 Identify the specific components of manual transmissions and transaxles. manual transmission / transaxle case, shafts, gears, synchronizers, bearings, bushings, thrust washers, shims, gaskets, seals transaxle final drive lubrication shift controls direct, remote shafts, cables, levers detent, interlock mechanisms, shift blocks</p> <p>3.3 Describe the operation of manual transmissions / transaxles. gear ratios power flows power flow variations synchronizer shift controls lubrication</p>
	<b>Course Outcome 4</b>	<b>Learning Objectives for Course Outcome 4</b>
	<p>Perform visual inspection, test, diagnose and repair manual transmission / transaxle according to manufacturers recommendations.</p>	<p>4.1 Perform inspection, testing, and diagnostic procedures on manual transmissions. identify component failures and causes check fluid level adjust linkage identify noise identify vibration</p> <p>4.2 Perform service and repair procedures. describe procedures to remove and install a transmission / transaxle dismantle and assemble manual transmission / transaxle verify power flow through gears check end play / run-out verify shift controls perform torque procedures for re-assembly perform alignment requirement identify fluid / lubrication requirements</p>

**Evaluation Process and Grading System:**

Evaluation Type	Evaluation Weight
Shop	40%

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	Theory Tests	60%
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**Date:** July 30, 2021

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

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