



## COURSE OUTLINE: AST815 - SUSP/STEER BRAKE SYS

Prepared: Stephen Kent

Approved: Corey Meunier, Chair, Technology and Skilled Trades

<b>Course Code: Title</b>	AST815: SUSPENSION/STEERING AND BRAKE SYSTEMS
<b>Program Number: Name</b>	6069: AUTO SERV TN LEVEL 3
<b>Department:</b>	MOTIVE POWER APPRENTICESHIP
<b>Semesters/Terms:</b>	20F, 21W
<b>Course Description:</b>	Upon successful completion the apprentice will have the ability describe and explain the construction and operation of power assisted brakes including inspection, testing and diagnostic procedures, the ability to inspect, test and diagnose anti lock, stability and traction controls systems including performing bleeding of the hydraulic system, the ability to explain the operation and components of electronic braking systems, tire pressure monitoring systems, and tire electronic suspension systems, the ability to perform pre-alignment inspections and a wheel alignment, and the ability to identify and explain vehicle handling problems - all according with manufacturers' standards and recommendations.
<b>Total Credits:</b>	5
<b>Hours/Week:</b>	0
<b>Total Hours:</b>	42
<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>	<div>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.</div> <div>EES 2 Respond to written, spoken, or visual messages in a manner that ensures effective communication.</div> <div>EES 3 Execute mathematical operations accurately.</div> <div>EES 4 Apply a systematic approach to solve problems.</div> <div>EES 5 Use a variety of thinking skills to anticipate and solve problems.</div> <div>EES 6 Locate, select, organize, and document information using appropriate technology and information systems.</div> <div>EES 7 Analyze, evaluate, and apply relevant information from a variety of sources.</div> <div>EES 8 Show respect for the diverse opinions, values, belief systems, and contributions of others.</div> <div>EES 9 Interact with others in groups or teams that contribute to effective working relationships and the achievement of goals.</div> <div>EES 10 Manage the use of time and other resources to complete projects.</div> <div>EES 11 Take responsibility for ones own actions, decisions, and consequences.</div>
<b>Course Evaluation:</b>	Passing Grade: 50%, D

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	A minimum program GPA of 2.0 or higher where program specific standards exist is required for graduation.												
<b>Other Course Evaluation &amp; Assessment Requirements:</b>	<p>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 (Student will be given notice of test and assignment dates in advance)</p> <p>The following semester grades will be assigned to students:</p> <p>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</p> <p>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.</p>												
<b>Books and Required Resources:</b>	Automotive Technology: A Systems Approach by Erjavec Publisher: Thomson Nelson Learning Canada Edition: 3rd Canadian												
<b>Course Outcomes and Learning Objectives:</b>	<table><tr><th>Course Outcome 1</th><th>Learning Objectives for Course Outcome 1</th></tr><tr><td rowspan="4">Describe and explain the construction and operation of power assisted brakes, including inspection, testing and diagnostic procedures in accordance with manufacturers, recommendations.</td><td>Describe the construction and types of power assisted brake systems.</td></tr><tr><td><ul style="list-style-type: none"><li>- vacuum assist</li><li>- hydraulic assist</li><li>- electric / hydraulic</li></ul></td></tr><tr><td>Explain the operation of power assisted brake systems.</td></tr><tr><td><ul style="list-style-type: none"><li>- vacuum assist</li><li>- hydraulic assist</li><li>- electric / hydraulic</li></ul></td></tr><tr><td></td><td>Inspect, test and diagnose power assisted brakes.</td></tr><tr><td></td><td><ul style="list-style-type: none"><li>- visual inspection</li><li>- leaks</li><li>- fluid levels</li></ul></td></tr></table>	Course Outcome 1	Learning Objectives for Course Outcome 1	Describe and explain the construction and operation of power assisted brakes, including inspection, testing and diagnostic procedures in accordance with manufacturers, recommendations.	Describe the construction and types of power assisted brake systems.	<ul style="list-style-type: none"><li>- vacuum assist</li><li>- hydraulic assist</li><li>- electric / hydraulic</li></ul>	Explain the operation of power assisted brake systems.	<ul style="list-style-type: none"><li>- vacuum assist</li><li>- hydraulic assist</li><li>- electric / hydraulic</li></ul>		Inspect, test and diagnose power assisted brakes.		<ul style="list-style-type: none"><li>- visual inspection</li><li>- leaks</li><li>- fluid levels</li></ul>	
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	<ul style="list-style-type: none"> <li>- operational and static test</li> <li>- test vacuum assist</li> <li>- test hydraulic assist</li> <li>- test electric / hydraulic</li> <li>- diagnosis</li> <li>- vacuum assist</li> <li>- hydraulic assist</li> <li>- electric / hydraulic</li> </ul>
<b>Course Outcome 2</b>	<b>Learning Objectives for Course Outcome 2</b>
Inspect, test and diagnose anti lock, stability and traction control systems including performing bleeding of the hydraulic system in accordance with manufactures' recommendations.	<p>Define the fundamentals of anti-lock brake, traction and stability control systems.</p> <ul style="list-style-type: none"> <li>- hydraulic pressure modulation</li> <li>- electronic controls</li> <li>- performance / advantages</li> </ul> <p>Identify and explain the construction, types, and application of anti-lock brake systems, stability and traction control systems and components.</p> <ul style="list-style-type: none"> <li>- integrated / non-integrated designs</li> <li>- electric pumps</li> <li>- accumulators</li> <li>- sensors</li> <li>- acceleration / yaw / pitch / roll sensors</li> <li>- valve body assembly</li> <li>- electronic controller</li> <li>- one-channel</li> <li>- two-channel</li> <li>- three-channel</li> <li>- four-channel</li> </ul> <p>Explain the principles of operation of anti-lock, stability and traction control systems.</p> <ul style="list-style-type: none"> <li>- safety procedures</li> <li>- integrated / non-integrated designs</li> <li>- electric pumps</li> <li>- accumulators</li> </ul> <ul style="list-style-type: none"> <li>- sensors</li> <li>- acceleration / yaw / pitch / roll sensors</li> <li>- valve body assembly</li> <li>- electronic controller</li> <li>- one-channel</li> <li>- two-channel</li> <li>- three-channel</li> <li>- four-channel</li> <li>- malfunction indicator lamps</li> <li>- ABS action during apply, hold and release</li> <li>- effects of tires</li> </ul>
<b>Course Outcome 3</b>	<b>Learning Objectives for Course Outcome 3</b>

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	Inspect, test, diagnose anti lock, stability and traction control systems including performing bleeding of the hydraulic system in accordance with manufactures` recommendations.	<p>Inspect, test and diagnose anti-lock, stability and traction control systems.</p> <ul style="list-style-type: none"> <li>- visual inspection</li> <li>- leaks</li> <li>- fluid levels</li> <li>- test system pressures</li> <li>- test accumulator operation</li> <li>- test control and sensor operation</li> <li>- extract and analyze data</li> <li>- retrieve fault codes</li> <li>- retrieve live data</li> </ul> <p>Perform assigned operations on anti-lock brake, stability and traction control systems.</p> <ul style="list-style-type: none"> <li>- bleed the air from the hydraulic systems</li> <li>- manual procedure</li> <li>- electronic service tool procedure</li> </ul>
	<b>Course Outcome 4</b>	<b>Learning Objectives for Course Outcome 4</b>
	Explain the operation and components of electronic braking systems in accordance with manufactures` recommendations.	<p>Explain the operation and components of electronic braking systems.</p> <ul style="list-style-type: none"> <li>- control units</li> <li>- wiring</li> <li>- calipers</li> <li>- solenoids</li> </ul>
	<b>Course Outcome 5</b>	<b>Learning Objectives for Course Outcome 5</b>
	Explain the operation and components of tire pressure monitoring systems in accordance with manufactures` recommendations.	<p>Explain the operation and components of tire pressure monitoring systems.</p> <ul style="list-style-type: none"> <li>- sensors</li> <li>- control units</li> </ul>
	<b>Course Outcome 6</b>	<b>Learning Objectives for Course Outcome 6</b>
	Explain the operation and components of tire electronic suspension systems in accordance with manufactures` recommendations.	<p>Explain the operation and components of electronic suspension system.</p> <ul style="list-style-type: none"> <li>- sensors</li> <li>- wiring</li> <li>- control units</li> </ul>
	<b>Course Outcome 7</b>	<b>Learning Objectives for Course Outcome 7</b>
	Perform pre-alignment inspections in accordance with manufactures recommendations.	<p>Perform pre-alignment checks following manufacturers recommendations.</p> <ul style="list-style-type: none"> <li>- tires</li> <li>- weight distribution / proper loading</li> <li>- trim height</li> <li>- bearing condition and adjustment</li> <li>- suspension system condition</li> </ul>

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		<ul style="list-style-type: none"><li>- requirements for tailoring alignment settings</li><li>- steering linkage condition</li></ul>						
	<b>Course Outcome 8</b>	<b>Learning Objectives for Course Outcome 8</b>						
	Identify and explain vehicle handling problems in accordance with manufactures standards.	Identify and explain vehicle handling problems. <ul style="list-style-type: none"><li>- vehicle pulls to one side</li><li>- vehicle instability</li><li>- vehicle wander</li><li>- bump steer</li><li>- excessive lean on corners</li><li>- vibration at cruise or deceleration</li><li>- low speed shimmy</li><li>- slow steering wheel return</li><li>- steering effort - heavy</li><li>- light</li><li>- excessive steering wheel free-play</li><li>- steering stability</li><li>- steering kickback</li><li>- vehicle roll</li><li>- high speed shimmy</li><li>- abnormal tire wear</li><li>- front tires</li><li>- rear tires</li></ul>						
	<b>Course Outcome 9</b>	<b>Learning Objectives for Course Outcome 9</b>						
	Perform a wheel alignment in accordance with manufactures` recommendations.	Perform wheel alignment in accordance with specific vehicle application. <ul style="list-style-type: none"><li>- obtain required specifications</li><li>- record alignment readings</li><li>- determine required adjustment</li><li>- perform required adjustments</li><li>- recheck readings</li><li>- verify final readings</li></ul>						
<b>Evaluation Process and Grading System:</b>	<table><tr><td><b>Evaluation Type</b></td><td><b>Evaluation Weight</b></td></tr><tr><td>shop</td><td>30%</td></tr><tr><td>Theory Tests</td><td>70%</td></tr></table>		<b>Evaluation Type</b>	<b>Evaluation Weight</b>	shop	30%	Theory Tests	70%
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<b>Date:</b>	September 2, 2020							
<b>Addendum:</b>	Please refer to the course outline addendum on the Learning Management System for further information.							

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