

Automotive Suspension and Steering

Course number-20123

Rational Statement:

There is a high demand for trained individuals in the automotive service field. The desire for the students to receive industry-based training at the basic level and step up to the higher level of competency in this field is the ultimate goal of this course. Completion of this course will aide students as they continue their education at the post-secondary level or in the workforce and in the preparation for their ASE certification test. (The examples listed are NATEF Tasks that the students may complete to assist them in their ASE certification)

Suggested grade level: 10-12

Topics Covered:

- Automotive technology safety practices
- General suspension and steering
- Steering systems
- Suspension systems: front & rear suspension
- Suspension systems: miscellaneous service
- Wheel alignment
- Wheel and tire service
- Career exploration

Core Technical Standards & Examples

Indicator #1: Demonstrate automotive technology safety practices including Occupational Safety and Health Administration (OSHA) and Environmental Protection Agency (EPA) requirements for an automotive repair facility.	
Bloom's Taxonomy Level	Standard and Examples
Apply	AS&S1.1 Demonstrate automotive technology safety practices. Examples: <ul style="list-style-type: none">• Use protective clothing and equipment according to OSHA and EPA requirements• Summarize the proper use of MSDS (Material Safety Data Sheet)• Demonstrate the proper use of hand and power tools• Examine basic shop safety using OSHA (Occupational Safety Health Administration) standards• Maintain a portfolio of successfully completed safety and equipment exams

Indicator # 2: Properly test, diagnose, service, and repair general suspension and steering systems

Bloom's Taxonomy Level	Standard and Examples
Analyze	<p>AS&S2.1 Understand general suspension and steering service.</p> <p>Examples:</p> <ul style="list-style-type: none"> • Complete work order which includes customer information, vehicle identification, customer concern, related service history, cause, and correction • Identify and interpret suspension and steering concern; determine necessary action • Research applicable vehicle and service information such as suspension and steering system operation, vehicle service history, service precautions, and technical service bulletins • Locate and interpret vehicle and major component identification numbers (VIN), vehicle certification labels, calibration decals

Indicator #3: Properly test, diagnose, service and repair steering systems

Bloom's Taxonomy Level	Standard and Examples
Analyze	<p>AS&S3.1 Diagnosis and determine necessary action to repair steering system.</p> <p>Examples:</p> <ul style="list-style-type: none"> • Inspect power steering fluid levels and condition • Diagnose and inspect steering column noises, looseness, and binding concerns (including tilt mechanisms); determine necessary action • Diagnose power steering fluid leakage; determine necessary action • Diagnose power steering gear in both non-rack and pinion and rack and pinion; binding, uneven turning effort, looseness hard steering, and fluid leakage concerns; determine necessary action • Test and diagnose components of electronically controlled steering systems using a scan tool; determine necessary action • Inspect and test non-hydraulic electric-power assist steering • Identify hybrid vehicle power steering system electrical currents, service, and safety precautions

Apply	<p>AS&S3.2 Repair steering system</p> <p>Examples:</p> <ul style="list-style-type: none"> • Disable and enable supplemental restraint system (SRS) • Remove and replace steering wheel; center/time supplemental restraint system coil (SRS clock spring) • Remove and replace manual or power rack and pinion steering gear; inspect mounting bushings and brackets • Inspect and replace manual or power rack and pinion steering gear inner tie rode ends (sockets) and bellows boots • Remove, inspect, replace, and adjust power steering pump belt • Inspect, replace, and adjust tie rod ends (sockets), tie rod sleeves, and clamps • Inspect and replace pitman arm, relay (centerlink/intermediate) rod, idler arm and mountings, and steering linkage damper • Inspect and replace power steering hoses and fittings • Adjust manual or power non-rack and pinion worm bearing preload and sector lash • Remove and reinstall power steering pump • Remove and reinstall power steering pump pulley; check pulley and belt alignment
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Indicator #4: Properly test, diagnose, service, and repair front and rear suspension systems	
Bloom's Taxonomy Level	Standard and Examples
Analyze	<p>AS&S4.1 Diagnosis and determine necessary action to repair front and rear suspension systems.</p> <p>Examples:</p> <ul style="list-style-type: none"> • Diagnose suspension system noises, body sway, and uneven riding height concerns; determine necessary action
Apply	<p>AS&S4.2 Repair front suspension systems.</p> <p>Examples:</p> <ul style="list-style-type: none"> • Remove, inspect and install upper and or lower ball joints • Remove, inspect, and install strut cartridge or assembly, strut coil spring, insulators (silencers), and upper strut bearing mount • Remove, inspect, and install strut rods (compression/tension) and bushings • Remove, inspect, and install steering knuckle assemblies • Remove, inspect, and install stabilizer bar bushings, brackets, and links • Lubricate suspension and steering systems • Remove, inspect, and install upper and lower control arms, bushing, shafts, and rebound bumpers • Remove, inspect, and install short and long arm suspension system coil springs and spring insulators

	<ul style="list-style-type: none"> Remove, inspect, install, and adjust suspension system torsion bars; inspect mounts
Apply	<p>AS&S4.3 Repair rear suspension systems.</p> <p>Examples:</p> <ul style="list-style-type: none"> Remove, inspect, and install coil springs and spring insulators Remove, inspect, and install transverse links, control arms, bushings, and mounts Remove, inspect, and install strut cartridge or assembly, strut coil spring, and insulators (silencers) Remove, inspect, and install leaf springs, leaf spring insulators (silencers), shackles, bracket bushings, and mounts Remove, inspect, install, and adjust suspension system torsion bars; inspect mounts

Indicator #5: Properly test, diagnose, service and repair suspension systems; miscellaneous service

Bloom's Taxonomy Level	Standard and Examples
Analyze	<p>AS&S5.1 Diagnosis and determine necessary action to repair suspension systems; miscellaneous service.</p> <p>Examples:</p> <ul style="list-style-type: none"> Test and diagnose components of electronically controlled suspension systems using a scan tool; determine necessary action
Apply	<p>AS&S5.2 Repair miscellaneous service.</p> <p>Examples:</p> <ul style="list-style-type: none"> Inspect, remove, and replace shock absorbers Remove, inspect, and service or replace front and rear wheel bearings

Indicator #6: Properly test, diagnose, service and repair wheel alignment

Bloom's Taxonomy Level	Standard and Examples
Analyze	<p>AS&S6.1 Diagnosis and determine necessary action to perform wheel alignment.</p> <p>Examples:</p> <ul style="list-style-type: none"> Diagnose vehicle wander, drift, pull, hard steering, bump steer, memory steer, torque steer, and steering return concerns; determine necessary action Perform pre-alignment inspection; perform necessary action Measure vehicle riding height; determine necessary action Measure toe-out-on-turns (turning radius); determine necessary action Check SAI (steering axis inclination) and included angle; determine necessary action

	<ul style="list-style-type: none"> • Diagnose front wheel setback; determine necessary action • Check front cradle (sub-frame) alignment; determine necessary action
Apply	<p>AS&S6.2 Perform calculation to make alignment repair.</p> <p>Examples:</p> <ul style="list-style-type: none"> • Measure and compare alignment angles to specifications and calculate correction • Perform alignment repair

Indicator #7: Properly test, diagnose, service, and repair wheel and tire service

Bloom's Taxonomy Level	Standard and Examples
Analyze	<p>AS&S7.1 Diagnosis and determine necessary action to repair wheels and tires.</p> <p>Examples:</p> <ul style="list-style-type: none"> • Diagnose tire wear patterns; determine necessary action • Diagnose wheel/tire vibration, shimmy, and noise; determine necessary action • Evaluate wheel, tire, axle, and hub runout; determine necessary action • Diagnose tire pull (lead) problem; determine necessary action • Inspect, diagnose, and calibrate tire pressure monitoring system

Apply	<p>AS&S7.2 Repair wheels and tires.</p> <p>Examples:</p> <ul style="list-style-type: none"> • Rotate tires according to manufacture's recommendations • Balance wheel and tire assembly (static and dynamic) • Reinstall wheel; torque lug nuts • Inspect tire and wheel assembly for air loss; perform necessary action • Dismount, inspect, repair and remount tire on wheel equipped with tire pressure sensor
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Indicator #8: Students explore career opportunities in the transportation, distribution, and logistics career cluster and develop leadership skills.

Bloom's Taxonomy Level	Standard and Examples
Understand	<p>AS&S8.1 Research career opportunities in the transportation, distribution and logistics (TD&L) fields.</p> <p>Examples:</p> <ul style="list-style-type: none">• Utilizing the career exploration software, research and write a report on career opportunities in the TD&L field• Utilizing the career exploration software, research educational requirements for a chosen career path• Utilizing career exploration software, update student's portfolio