

# STRANDS AND STANDARDS

## ASE SUSPENSION AND STEERING



### Course Description

This course is part of a sequence that prepares individuals to engage in the servicing and maintenance of all types of automobiles. Instruction includes training in safety, the diagnosis of malfunctions and repair of steering and suspension systems. This course is based on the Automotive Service Excellence (ASE) task list. Work ethics and productivity are an integral part of the classroom and lab activities of these courses. The most current information can be found at the AST Task List at the following address: <https://www.asealliance.org/natef-accreditation/program-standards>.



## ASE SUSPENSION AND STEERING

<b>Intended Grade Level</b>	11-12
Units of Credit	Minimum 0.5
Core Code	40.09.00.00.023
Concurrent Enrollment Core Code	40.09.00.13.023
Prerequisite	Introduction to Automotive
Skill Certification Test Number	Industry test 956
Test Weight	1.0
<b>License Type</b>	CTE and/or Secondary Education 6-12
<b>Required Endorsement(s)</b>	
Endorsement 1	Automotive Service
Endorsement 2	N/A
Endorsement 3	N/A

### STRAND 1

**Students will be able to understand, identify, and properly diagnose and repair steering systems.**

#### Standard 1

Interpret and verify complaint; disable Supplemental Restraint System (SRS) in accordance with manufacturer's procedures.

#### Standard 2

Diagnose steering column noises, looseness, and binding problems (including tilt mechanisms); determine needed repairs.

#### Standard 3

Diagnose power non-rack and pinion steering gear binding, uneven turning effort, looseness, hard steering, and fluid leakage problems; determine needed repairs.

#### Standard 4

Diagnose power rack and pinion steering gear vibration, looseness, and hard steering problems; determine needed repairs.

#### Standard 5

Inspect and replace steering shaft universal-joint(s), flexible coupling(s), collapsible column, lock cylinder mechanism, and steering wheel.

#### Standard 6

Adjust manual or power non-rack and pinion worn bearing preload and sector lash.

#### Standard 7

Remove and replace manual or power rack and pinion steering gear; inspect mounting bushings and brackets.

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### Standard 8

Disassemble, inspect, repair, and reassemble rack and pinion steering gear.

### Standard 9

Adjust manual or power rack and pinion steering gear.

### Standard 10

Inspect and replace manual or power rack and pinion steering gear inner tie rod ends (sockets) and bellows boots.

### Standard 11

Inspect manual and power steering fluid levels and condition.

### Standard 12

Flush power steering system.

### Standard 13

Diagnose power steering fluid leakage; determine needed repairs.

### Standard 14

Inspect, adjust, or replace and adjust power steering pump belt.

### Standard 15

Remove, inspect, and replace power steering pump, pump mounts, pump seals, and gaskets.

### Standard 16

Remove, inspect, and replace power steering pump pulley; check alignment.

### Standard 17

Perform power steering system pressure test; determine needed repairs.

### Standard 18

Inspect and replace power steering hose and fittings.

### Standard 19

Inspect and replace pitman arm, relay (centerlink/intermediate) rod, idler arm and mountings, and steering linkage damper.

### Standard 20

Inspect, replace, and adjust tie rod ends (sockets), tie rod sleeves, and clamps.

### Standard 21

Diagnose, inspect, adjust, repair, or replace components of electronically controlled steering systems.

# ASE SUSPENSION AND STEERING

## Performance Skill

Understand, identify, and properly diagnose and repair steering systems.

- Interpret and verify complaint; disable Supplemental Restraint System (SRS) in accordance with manufacturer's procedures.
- Diagnose steering column noises, looseness, and binding problems (including tilt mechanisms); determine needed repairs.
- Diagnose power non-rack and pinion steering gear binding, uneven turning effort, looseness, hard steering, and fluid leakage problems; determine needed repairs.
- Diagnose power rack and pinion steering gear vibration, looseness, and hard steering problems; determine needed repairs.
- Inspect and replace steering shaft universal-joint(s), flexible coupling(s), collapsible column, lock cylinder mechanism, and steering wheel.
- Adjust manual or power non-rack and pinion worn bearing preload and sector lash.
- Remove and replace manual or power rack and pinion steering gear; inspect mounting bushings and brackets.
- Disassemble, inspect, repair, and reassemble rack and pinion steering gear.
- Adjust manual or power rack and pinion steering gear.
- Inspect and replace manual or power rack and pinion steering gear inner tie rod ends (sockets) and bellows boots.
- Inspect manual and power steering fluid levels and condition.
- Flush power steering system.
- Diagnose power steering fluid leakage; determine needed repairs.
- Inspect, adjust, or replace and adjust power steering pump belt.
- Remove, inspect, and replace power steering pump, pump mounts, pump seals, and gaskets.
- Remove, inspect, and replace power steering pump pulley; check alignment.
- Perform power steering system pressure test; determine needed repairs.
- Inspect and replace power steering hose and fittings.
- Inspect and replace pitman arm, relay (centerlink/intermediate) rod, idler arm and mountings, and steering linkage damper.
- Inspect, replace, and adjust tie rod ends (sockets), tie rod sleeves, and clamps.
- Diagnose, inspect, adjust, repair, or replace components of electronically controlled steering systems.

## STRAND 2

**Students will be able to understand, identify, and properly diagnose and repair front suspension systems.**

### Standard 1

Diagnose short and long arm-type suspension system noises, body sway, and uneven riding height problems; determine needed repairs.

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## Standard 2

Diagnose MacPherson strut suspension system noises, body sway, and uneven riding height problems; determine needed repairs.

## Standard 3

Remove, inspect, and replace upper and lower control arms, bushings, shafts, and rebound bumpers.

## Standard 4

Remove, inspect, replace, and adjust strut (compression/tension) rods and bushings.

## Standard 5

Remove, inspect, and replace upper and lower ball joints on short and long arm suspension systems.

## Standard 6

Remove, inspect, and replace steering knuckle assemblies.

## Standard 7

Remove, inspect, and replace short and long arm suspension system coil springs and spring insulators.

## Standard 8

Remove, inspect, replace, and adjust suspension system torsion bars; inspect mounts.

## Standard 9

Remove, inspect, and replace stabilizer bar bushings, brackets, and links.

## Standard 10

Remove, inspect, and replace ball joints on MacPherson strut suspension system.

## Standard 11

Remove, inspect, and replace ball joints on MacPherson strut cartridge or assembly, strut coil spring, and insulators.

## Standard 12

Lubricate suspension and steering systems.

## Performance Skill

Understand, identify, and properly diagnose and repair front suspension systems.

- Diagnose short and long arm-type suspension system noises, body sway, and uneven riding height problems; determine needed repairs.
- Diagnose MacPherson strut suspension system noises, body sway, and uneven riding height problems; determine needed repairs.
- Remove, inspect, and replace upper and lower control arms, bushings, shafts, and rebound bumpers.
- Remove, inspect, replace, and adjust strut (compression/tension) rods and bushings.

## ASE SUSPENSION AND STEERING

- Remove, inspect, and replace upper and lower ball joints on short and long arm suspension systems.
- Remove, inspect, and replace steering knuckle assemblies.
- Remove, inspect, and replace short and long arm suspension system coil springs and spring insulators.
- Remove, inspect, replace, and adjust suspension system torsion bars; inspect mounts.
- Remove, inspect, and replace stabilizer bar bushings, brackets, and links.
- Remove, inspect, and replace ball joints on MacPherson strut suspension system.
- Remove, inspect, and replace ball joints on MacPherson strut cartridge or assembly, strut coil spring, and insulators.
- Lubricate suspension and steering systems.

### STRAND 3

**Students will be able to understand, identify, and properly diagnose and repair rear suspension systems.**

#### Standard 1

Remove, inspect, and replace coil springs and spring insulators.

#### Standard 2

Remove, inspect, and replace transverse links, control arms, bushings, and mounts.

#### Standard 3

Remove, inspect, and replace leaf springs, leaf spring insulators (silencers), shackles, brackets, bushings, and mounts.

#### Standard 4

Remove, inspect, and replace MacPherson strut cartridge or assembly, strut coil spring, and insulators (silencers).

#### Performance Skill

Understand, identify, and properly diagnose and repair rear suspension systems.

- Remove, inspect, and replace coil springs and spring insulators.
- Remove, inspect, and replace transverse links, control arms, bushings, and mounts.
- Remove, inspect, and replace leaf springs, leaf spring insulators (silencers), shackles, brackets, bushings, and mounts.
- Remove, inspect, and replace MacPherson strut cartridge or assembly, strut coil spring, and insulators (silencers).

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## STRAND 4

**Students will be able to understand, identify, and properly diagnose and repair miscellaneous items.**

### Standard 1

Inspect and replace shock absorbers.

### Standard 2

Remove, inspect, and service or replace front or rear wheel bearings.

### Standard 3

Diagnose, inspect, adjust, repair, or replace components of electronically controlled suspension systems.

### Performance Skill

Understand, identify, and properly diagnose and repair miscellaneous items.

- Inspect and replace shock absorbers.
- Remove, inspect, and service or replace front or rear wheel bearings.
- Diagnose, inspect, adjust, repair, or replace components of electronically controlled suspension systems.

## STRAND 5

**Students will be able to understand, identify, and properly diagnose, adjust, and repair wheel alignment.**

### Standard 1

Diagnose vehicle wandering, pulling, hard steering, and poor steering return problems; determine needed repairs.

### Standard 2

Measure vehicle riding height; determine needed repairs.

### Standard 3

Check and adjust front and rear wheel camber (where applicable); determine needed repairs.

### Standard 4

Check and adjust caster (where applicable); determine needed repairs.

### Standard 5

Check and adjust front wheel toe; adjust as needed.

### Standard 6

Center steering wheel.

### Standard 7

Check toe-out-on-turns (turning radius); determine needed repairs.

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## Standard 8

Check SAI (steering axis inclination)/KPI (king pin inclination) and included angle; determine needed repairs.

## Standard 9

Check and adjust (where applicable) rear wheel toe.

## Standard 10

Check rear wheel thrust angle; determine needed repairs.

## Standard 11

Check for front wheel setback; determine needed repairs.

## Standard 12

Check front cradle (sub-frame) alignment; determine needed repairs.

## Performance Skill

Understand, identify, and properly diagnose, adjust, and repair wheel alignment.

- Diagnose vehicle wandering, pulling, hard steering, and poor steering return problems; determine needed repairs.
- Measure vehicle riding height; determine needed repairs.
- Check and adjust front and rear wheel camber (where applicable); determine needed repairs.
- Check and adjust caster (where applicable); determine needed repairs.
- Check and adjust front wheel toe; adjust as needed.
- Center steering wheel.
- Check toe-out-on-turns (turning radius); determine needed repairs.
- Check SAI (steering axis inclination)/KPI (king pin inclination) and included angle; determine needed repairs.
- Check and adjust (where applicable) rear wheel toe.
- Check rear wheel thrust angle; determine needed repairs.
- Check for front wheel setback; determine needed repairs.
- Check front cradle (sub-frame) alignment; determine needed repairs.

## STRAND 6

**Students will be able to understand, identify, and properly diagnose and repair wheels and tires.**

### Standard 1

Diagnose unusual tire wear patterns; determine needed repairs.

### Standard 2

Inspect tires, check and adjust air pressure.



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### Standard 3

Diagnose wheel and tire vibration (shimmy and tramp) problems; determine needed repairs.

### Standard 4

Rotate tires according to manufacturer's recommendations.

### Standard 5

Measure wheel, tire, axle, and hub runout; determine needed repairs.

### Standard 6

Diagnose tire pull (lead) problems; determine corrective actions.

### Standard 7

Balance wheel and tire assembly (static or dynamic).

### Standard 8

Dismount, inspect, repair, and remount tire on wheel.

### Standard 9

Reinstall wheel; torque lug nuts.

### Performance Skill

Understand, identify, and properly diagnose and repair wheels and tires.

- Diagnose unusual tire wear patterns; determine needed repairs.
- Inspect tires, check and adjust air pressure.
- Diagnose wheel and tire vibration (shimmy and tramp) problems; determine needed repairs.
- Rotate tires according to manufacturer's recommendations.
- Measure wheel, tire, axle, and hub runout; determine needed repairs.
- Diagnose tire pull (lead) problems; determine corrective actions.
- Balance wheel and tire assembly (static or dynamic).
- Dismount, inspect, repair, and remount tire on wheel.
- Reinstall wheel; torque lug nuts.

## STRAND 7

**Students will understand the importance of career readiness skills as it relates to the workplace and outlined in the SkillsUSA Framework – Level 2.**

### Standard 1

Understand and demonstrate reliability.

- Determine individual time management skills.
- Explore what's ethical in the workplace or school.
- Demonstrate awareness of government.
- Demonstrate awareness of professional organizations and trade unions.

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## Standard 2

Understand and demonstrate responsiveness.

- Define the customer.
- Recognize benefits of doing a community service project.
- Demonstrate social etiquette.
- Identify customer expectations.

## Standard 3

Understand resiliency.

- Discover self-motivation techniques and establish short-term goals.
- Select characters of a positive image.
- Identify a mentor.

## Standard 4

Understand and demonstrate workplace habits.

- Participate in a shadowing activity.
- Explore workplace ethics: codes of conduct.
- Recognize safety issues.
- Perform a skill demonstration.
- Exercise your right to know.

## Standard 5

Understand and develop initiative.

- Develop personal financial skills.
- Develop a business plan.
- Investigate entrepreneurship opportunities.

## Standard 6

Understand and demonstrate continuous improvement.

- Conduct a worker interview.
- Demonstrate evaluation skills.
- Examine ethics and values in the workplace.
- Develop a working relationship with a mentor.
- Construct a job search network.

## STRAND 8

**Students will understand the importance of career readiness skills as it relates to the workplace and outlined in the SkillsUSA Framework – Level 3.**

## Standard 1

Understand and develop collaboration skills.

- Develop a working relationship with a mentor.
- Apply supervisory skills.
- Manage a project and evaluate others.

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## Standard 2

Understand and demonstrate change management skills.

- Evaluate your career and training goals.
- Identify and apply conflict resolution skills.
- Illustrate an organizational structure.
- Plan and implement a leadership project.

## Standard 3

Understand how customer service applies to the workplace.

- Serve as a volunteer in the community.
- Examine workplace ethics: the role of values in making decisions.
- Understand the cost of customer service.
- Develop customer service skills.
- Maximize customer service skills.

## Standard 4

Understand and demonstrate career readiness.

- Market your career choice.
- Research resume writing.
- Demonstrate interviewing skills.
- Predict employment trends.
- Re-evaluate career goals and establish long-term goals.
- Construct a job search network.
- Evaluate professional competencies.
- Analyze your entry-level job skills.
- Design and present a lesson plan on an aspect of your career choice.
- Write an article for a professional journal in your career area.
- Refine your employment portfolio.