

ILLINOIS VALLEY COMMUNITY COLLEGE



COURSE OUTLINE

DIVISION: Workforce Development

COURSE: ATO 1260 – Steering & Suspension Systems

Date: Spring 2014

Credit Hours: 4.5

Prerequisite(s): None

Delivery Method: **Lecture** **2 Contact Hours** (1 contact = 1 credit hour)
 Seminar **0 Contact Hours** (1 contact = 1 credit hour)
 Lab **5 Contact Hours** (2 contact = 1 credit hour)
 Clinical **0 Contact Hours** (3 contact = 1 credit hour)
 Online
 Blended

Offered: **Fall** **Spring** **Summer**

IAI Equivalent –**Only for Transfer Courses**-go to <http://www.itransfer.org>.

CATALOG DESCRIPTION:

This course describes the various styles of automotive suspension and steering systems and their components. They include wheel bearings, tires, shock absorbers and struts, front and rear suspension systems, steering columns, power steering, gear boxes, rack and pinion steering, four wheel steering systems, alignment angles and four wheel alignment. The main emphasis in this class will be on performing a complete 4-wheel alignment on any vehicle.

GENERAL EDUCATION GOALS ADDRESSED

[See the last page of this form for more information.]

Upon completion of the course, the student will be able:

[Choose those goals that apply to this course.]

- To apply analytical and problem solving skills to personal, social and professional issues and situations.
- To communicate orally and in writing, socially and interpersonally.
- To develop an awareness of the contributions made to civilization by the diverse cultures of the world.
- To understand and use contemporary technology effectively and to understand its impact on the individual and society.
- To work and study effectively both individually and in collaboration with others.
- To understand what it means to act ethically and responsibly as an individual in one's career and as a member of society.
- To develop and maintain a healthy lifestyle physically, mentally, and spiritually.
- To appreciate the ongoing values of learning, self-improvement, and career planning.

EXPECTED LEARNING OUTCOMES AND RELATED COMPETENCIES:

[Outcomes related to course specific goals.]

Upon completion of the course, the student will be able to:

- IV. Suspension and Steering Tasks (NATEF)
 - A. General Suspension and Steering Systems Diagnosis
 - IV.A.1. Identify and interpret suspension and steering concern; determine necessary action.
 - IV.A.2. Research applicable vehicle and service information, such as suspension and steering system operation, vehicle service history, service precautions, and technical service bulletins
 - IV.A.3. Locate and interpret vehicle and major component identification numbers (VIN, vehicle certification labels, calibration decals).
 - B. Steering Systems Diagnosis and Repair
 - IV.B.1. Disable and enable supplemental restraint system (SRS).
 - IV.B.2. Remove and replace steering wheel; center/time supplemental restraint system (SRS) coil (clock spring).
 - IV.B.3. Diagnose steering column noises, looseness, and binding concerns (including tilt mechanisms); determine necessary action.
 - IV.B.4. Diagnose power steering gear (non rack and pinion) binding, uneven turning effort, looseness, hard steering, and fluid leakage concerns; determine necessary action.
 - IV.B.5. Diagnose power steering gear (rack and pinion) binding, uneven turning effort, looseness, hard steering, and fluid leakage concerns; determine necessary action.
 - IV.B.6. Inspect steering shaft universal joints(s), flexible coupling(s), collapsible column, lock cylinder mechanism, and steering wheel; perform necessary action.

- IV.B.7. Adjust manual or power non rack and pinion worm bearing preload and sector lash.
 - IV.B.8. Remove and replace manual or power rack and pinion steering gear; inspect mounting bushings and brackets.
 - IV.B.9. Inspect and replace manual or power rack and pinion steering gear inner tie rod ends (sockets) and bellows boots.
 - IV.B.10. Inspect power steering fluid levels and condition.
 - IV.B.11. Flush, fill, and bleed power steering system.
 - IV.B.12. Diagnose power steering fluid leakage; determine necessary action.
 - IV.B.13. Remove, inspect, replace, and adjust power steering pump belt.
 - IV.B.14. Remove and reinstall power steering pump.
 - IV.B.15. Remove and reinstall power steering pump pulley; check pulley and belt alignment.
 - IV.B.16. Inspect and replace power steering hoses and fittings.
 - IV.B.17. Inspect and replace pitman arm, relay (centerlink/intermediate) rod, idler arm and mountings, and steering linkage damper
 - IV.B.18. Inspect, replace, and adjust tie rod ends (sockets), tie rod sleeves, and clamps.
 - IV.B.19. Test and diagnose components of electronically controlled steering systems using a scan tool; determine necessary action.
- C. Suspension Systems Diagnosis and Repair
- 1. Front Suspension
 - IV.C.1.1. Diagnose short and long arm type suspension system noises, body sway, and uneven riding height concerns; determine necessary action.
 - IV.C.1.2. Diagnose strut suspension system noises, body sway, and uneven riding height concerns; determine necessary action.
 - IV.C.1.3. Remove, inspect, and install upper and lower control arms, bushings, shafts and rebound bumpers.
 - IV.C.1.4. Remove, inspect, and install strut (compression/tension) rods and bushings.
 - IV.C.1.5. Remove, inspect and install upper and lower ball joints.
 - IV.C.1.6. Remove, inspect and install steering knuckle assemblies.
 - IV.C.1.7. Remove, inspect and install short and long arm suspension system coil springs and spring insulators.
 - IV.C.1.8. Remove, inspect, install, and adjust suspension system torsion bars; inspect mounts.
 - IV.C.1.9. Remove, inspect and install stabilizer bar bushings, brackets, and links.
 - IV.C.1.10. Remove, inspect and install strut cartridge or assembly, strut coil spring, insulators, (silencers) and upper strut bearing mount.
 - IV.C.1.11. Lubricate suspension/steering systems.
 - 2. Rear Suspension
 - IV.C.2.1. Remove, inspect and install coil springs and spring insulators.
 - IV.C.2.2. Remove, inspect and replace transverse links, control arms, bushings, and mounts.

IV.C.2.3. Remove, inspect and install leaf springs, leaf spring insulators (silencers), shackles, brackets, bushings, and mounts.

IV.C.2.4. Remove, inspect and install strut cartridge or assembly, strut coil spring, and insulators (silencers).

3. Miscellaneous Service

IV.C.3.1. Inspect, remove and replace shock absorbers.

IV.C.3.2. Remove, inspect, and service or replace front and rear wheel bearings.

IV.C.3.3. Test and diagnose components of electronically controlled suspension systems using a scan tool; determine necessary action.

D. Wheel Alignment Diagnosis, Adjustment, and Repair

IV.D.1. Differentiate between steering and suspension concerns using principles of steering geometry (caster, camber, toe, etc).

IV.D.2. Diagnose vehicle wander, drift, pull, hard steering, bump steer, memory steer, torque steer, and steering return concerns; determine necessary action.

IV.D.3. Perform pre-alignment inspection; perform necessary action.

IV.D.4. Measure vehicle riding height; determine necessary action.

IV.D.5. Check and adjust front and rear wheel camber; perform necessary action.

IV.D.6. Check and adjust caster; perform necessary action.

IV.D.7. Check and adjust front wheel toe; adjust as needed.

IV.D.8. Center steering wheel.

IV.D.9. Check toe out on turns (turning radius); determine necessary action.

IV.D.10. Check SAI (steering axis inclination) and included angle; determine necessary action.

IV.D.11. Check and adjust rear wheel toe.

IV.D.12. Check rear wheel thrust angle; determine necessary action.

IV.D.13. Check for front wheel setback; determine necessary action.

IV.D.14. Check front cradle (subframe) alignment; determine necessary action.

E. Wheel and Tire Diagnosis and Repair

IV.E.1. Diagnose tire wear patterns; determine necessary action.

IV.E.2. Inspect tires, check and adjust air pressure.

IV.E.3. Diagnose wheel/tire vibration, shimmy, and noise; determine necessary action.

IV.E.4. Rotate tires according to manufacturer's recommendations.

IV.E.5. Measure wheel, tire, axle, and hub runout; determine necessary action.

IV.E.6. Diagnose tire pull (lead) problem; determine corrective actions.

IV.E.7. Balance wheel and tire assembly (static and dynamic).

IV.E.8. Dismount, inspect, repair and remount tire on wheel.

IV.E.9. Reinstall wheel; torque lug nuts.

IV.E.10. Inspect and repair tire

COURSE TOPICS AND CONTENT REQUIREMENTS:

- I. Basic Shop Safety
 - A. Occupational Safety and Health Act
 - B. Shop Hazards
 - C. Shop Safety Rules
 - D. Shop Safety Equipment
 - E. Hazardous Waste Disposal
- II. Tools and Safety
 - A. Measuring Systems
 - B. Suspension Tools
 - C. Hydraulic Jack and Safety Stand Safety
 - D. Lift/Hoist Safety
 - E. Power Tool Safety
- III. Wheel Bearings
 - A. Bearing Loads
 - B. Tapered, Roller, Needle, and Ball Bearing Design
 - C. Front and Rear Bearing Design
 - D. FWD and RWD Bearing Design
 - E. Bearing Lubrication
 - F. Diagnosis of Bearing Problems
 - G. Proper Service and Adjustment of Tapered Roller Bearing Design
 - H. FWD Bearing Replacement
 - I. RWD Bearing Replacement
 - J. Axle Shaft Removal Procedures
- IV. Tires and Wheels
 - A. Tire Design
 - B. Tire Ratings and Sidewall Information
 - C. Specialty Tires
 - D. Replacement Tires
 - E. Tire Valves
 - F. Compact Spare Tires
 - G. Run-Flat Tires
 - H. Tire Placard Information and Location
 - I. Diagnosis of Tire Noises
 - J. Proper Tire Rotation
 - K. Tire and Wheel Service
 - L. Wheel Rim Service
 - M. Tire Changer Procedures
 - N. Tread Wear Measurements
 - O. Tire Inflation Pressure
 - P. Wheel Weights
 - Q. Static Wheel Balance Procedure
 - R. Dynamic Wheel Balance Procedure
- V. Shock Absorbers and Struts
 - A. Shock Absorber Designs and Ratios
 - B. Shock Absorber Operation
 - C. Nitrogen Gas-Filled Shock Absorbers and Struts
 - D. Strut Design for Front and Rear Suspension
 - E. Adjustable Struts

- F. Load Leveling Shock Absorbers
- G. Electronically Controlled Shock Absorbers
- H. Visual Tests for Shocks and Struts
- I. Bounce Tests for Shocks and Struts
- J. Shock and Strut Replacement Procedures
- K. Strut Cartridge Replacement Procedures
- L. Diagnosis of Electronically Controlled Shock Absorbers
- VI. Front Suspension Systems
 - A. System Components
 - B. I-Beam Front Suspension
 - C. Short-and-Long Arm Suspension
 - D. MacPherson Strut
 - E. High Performance Front Suspension Systems
 - F. Torsion Bar Suspension
 - G. Curb Ride Height
 - H. Front Spring Sag
 - I. Front Suspension Diagnosis and Service
 - J. Control Arm Diagnosis and Service
 - K. Removing and Replacing Torsion Bars
- VII. Rear Suspension Systems
 - A. Noise, Vibration, and Harshness Identification
 - B. Live-Axle Rear Suspension Systems
 - C. Semi-Independent Rear Suspension Systems
 - D. Independent Rear Suspension Systems
 - E. Curb Ride Height and Spring Sag
 - F. Rear Suspension Diagnosis and Service
 - G. Lower Control Arm and Ball Joint Diagnosis and Replacement
- VIII. Computer-Controlled Suspension Systems
 - A. Programmed Ride Control System
 - B. Computer Command Ride Control System
 - C. Electronic Air Suspension System
 - D. Rear Load-Leveling Air Suspension System
 - E. Automatic Air Suspension System
 - F. Automatic Ride Control – Four-Wheel Drive Vehicles
 - G. Continuously Variable Road Sensing Suspension Systems
 - H. Integrated Electronic Systems
 - I. Vehicle Stability Control
 - J. Active Roll Control Systems
 - L. Inspection and Diagnosis of All Above Systems
- IX. Steering Columns and Steering Linkage Mechanisms
 - A. Conventional Non-Tilt Steering Column
 - B. Tilt Steering Column
 - C. Steering Linkage Mechanisms and Steering Damper
 - D. Air Bag Deployment Components
 - E. Air Bag Service and Repair
 - F. Steering Column Diagnosis, Service, and Repair
 - G. Steering Linkage Diagnosis and Repair
- X. Power Steering Pumps
 - A. Drive Belts Designs and Service

- B. Types of Power-Assisted Steering Systems
- C. Power Steering Pump Design
- D. Power Steering Pumps and 42-Volt Electrical Systems
- E. Power Steering Pump Fluid Service
- F. Power Steering Pump Diagnosis and Service
- G. Inspecting and Servicing Power Steering Lines and Hoses
- H. Power Steering Hose Replacement
- XI. Recirculating Ball Steering Gears
 - A. Manual Recirculating Ball Steering Gears Design
 - B. Power Recirculating Ball Steering Gears Design
 - C. Manual Recirculating Ball Steering Gear Diagnosis and Replacement
 - D. Power Recirculating Ball Steering Gear Diagnosis and Replacement
 - E. Manual and Power Recirculating Ball Steering Gear Adjustments
- XII. Rack and Pinion Steering Gears
 - A. Manual Rack and Pinion Steering Gear Design
 - B. Power Rack and Pinion Steering Gear Design
 - C. Types of Power Rack and Pinion Steering Gears
 - D. Steering Gear Ratio
 - E. Electronic Power Steering Designs
 - F. Rack and Pinion On-Car Inspection and Removal Procedures
 - G. Manual and Power Rack and Pinion Steering Gear Adjustments
 - H. Diagnosis of Electronic Power Steering Systems
- XIII. Four-Wheel Steering Systems
 - A. Quadrasteer Four-Wheel Steering Systems
 - B. Electronically Controlled Four-Wheel Steering
 - C. Preliminary Inspection
 - D. Fail-Safe Function
 - E. Damper Control
 - F. Trouble Code Diagnosis
 - G. Rear Steering Actuator Adjustment
- XIV. Four-Wheel Alignment
 - A. Wheel Alignment Theory
 - B. Rear Wheel Alignment and Tracking Problems
 - C. Types of Wheel Alignments
 - D. Camber, Caster, and Steering Axis Inclination Fundamentals
 - E. Scrub Radius, Wheel Setback, Toe, and Turning Radius Fundamentals
 - F. Proper Pre-Alignment Inspection
 - G. Adjustments Available to Wheel Alignment Angles by OEM and Aftermarket Companies for Front and Rear Wheels
 - H. Computer Wheel Alignment Adjustment Screens
 - I. Proper Method for Centering Steering Wheel

INSTRUCTIONAL METHODS:

1. Lecture
2. Demonstrations
3. Practical (Lab)
4. Transparencies
5. Power Point
6. Alldata and Mitchell On-Demand

7. Internet
8. Class Discussion
9. Handouts
10. Quizzes and Tests

INSTRUCTIONAL MATERIALS:

Knowles, Don. Automotive Suspension & Steering Systems. Delmar Thomson Learning Company, 3rd Edition, 2003.

STUDENT REQUIREMENTS AND METHODS OF EVALUATION:

1. Complete all lab objectives (NATEF Tasks)
2. Practical Application
3. Attendance
4. Work Habits
5. Attitude
6. Safety Practices
7. Student Notebook
8. Ability to Work with Others
9. Written Exams and Quizzes
10. Class Participation

OTHER REFERENCES

1. Alldata and Mitchell On-Demand, DVD Information System (Both Labs, Office, and Classroom)
2. Automotive Steering, Suspension, and Alignment -- Halderman, (Auto Office)
3. Automotive Chassis Systems – Halderman (Auto Office)
4. Automotive Steering & Suspension – Chek-Chart (Auto Office)

Course Competency/Assessment Methods Matrix

ATO 1260 – Steering & Suspension Systems	Assessment Options																															
For each competency/outcome place an “X” below the method of assessment to be used.	Assessment of Student Learning	Article Review	Case Studies	Group Projects	Lab Work	Oral Presentations	Pre-Post Tests	Quizzes	Written Exams	Artifact Self Reflection of Growth	Capstone Projects	Comprehensive Written Exit Exam	Course Embedded Questions	Multi-Media Projects	Observation	Writing Samples	Portfolio Evaluation	Real World Projects	Reflective Journals	Applied Application (skills) Test	Oral Exit Interviews	Accreditation Reviews/Reports	Advisory Council Feedback	Employer Surveys	Graduate Surveys	Internship/Practicum /Site Supervisor Evaluation	Licensing Exam	In Class Feedback	Simulation	Interview	Written Report	Assignment
	Direct/ Indirect	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	I	I	I	I	D	D						
Assessment Measures – Are direct or indirect as indicated. List competencies/outcomes below.																																
IV.A.1. Suspension and Steering Tasks - Identify and interpret suspension and steering concern; determine necessary action.				X																												
IV.A.2. Suspension and Steering Tasks - Research applicable vehicle and service information, such as suspension and steering system operation, vehicle service history, service precautions, and technical service bulletins				X																												
IV.A.3. Suspension and Steering Tasks - Locate and interpret vehicle and major component identification numbers (VIN, vehicle certification labels, calibration decals).				X		X	X																									
IV.B.1. Suspension and Steering Tasks - Disable and enable supplemental restraint system (SRS).				X																												

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For each competency/outcome place an “X” below the method of assessment to be used.	Assessment of Student Learning	Article Review	Case Studies	Group Projects	Lab Work	Oral Presentations	Pre-Post Tests	Quizzes	Written Exams	Artifact Self Reflection of Growth	Capstone Projects	Comprehensive Written Exit Exam	Course Embedded Questions	Multi-Media Projects	Observation	Writing Samples	Portfolio Evaluation	Real World Projects	Reflective Journals	Applied Application (skills) Test	Oral Exit Interviews	Accreditation Reviews/Reports	Advisory Council Feedback	Employer Surveys	Graduate Surveys	Internship/Practicum /Site Supervisor Evaluation	Licensing Exam	In Class Feedback	Simulation	Interview	Written Report	Assignment
Assessment Measures – Are direct or indirect as indicated. List competencies/outcomes below.	Direct/ Indirect	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	I	I	I	I	D	D							
IV.B.2. Suspension and Steering Tasks - Remove and replace steering wheel; center/time supplemental restraint system (SRS) coil (clock spring).				X																												
IV.B.3. Suspension and Steering Tasks - Diagnose steering column noises, looseness, and binding concerns (including tilt mechanisms); determine necessary action.				X																												
IV.B.4. Suspension and Steering Tasks - Diagnose power steering gear (non rack and pinion) binding, uneven turning effort, looseness, hard steering, and fluid leakage concerns; determine necessary action.				X																												

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Assessment Measures – Are direct or indirect as indicated. List competencies/outcomes below.	Direct/ Indirect	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	I	I	I	I	D	D							
IV.B.5. Suspension and Steering Tasks - Diagnose power steering gear (rack and pinion) binding, uneven turning effort, looseness, hard steering, and fluid leakage concerns; determine necessary action.				X																												
IV.B.6. Suspension and Steering Tasks - Inspect steering shaft universal joints(s), flexible coupling(s), collapsible column, lock cylinder mechanism, and steering wheel; perform necessary action.				X																												
IV.B.7. Suspension and Steering Tasks - Adjust manual or power non rack and pinion worm bearing preload and sector lash.				X		X	X																									
IV.B.8. Suspension and Steering Tasks - Remove and replace manual or power rack and pinion steering gear; inspect mounting bushings and brackets			X																													

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For each competency/outcome place an “X” below the method of assessment to be used.	Assessment of Student Learning																			
	Article Review	Case Studies	Group Projects	Lab Work	Oral Presentations	Pre-Post Tests	Quizzes	Written Exams	Artifact Self Reflection of Growth	Capstone Projects	Comprehensive Written Exit Exam	Course Embedded Questions	Multi-Media Projects	Observation	Writing Samples	Portfolio Evaluation	Real World Projects	Reflective Journals	Applied Application (skills) Test	
Assessment Measures – Are direct or indirect as indicated. List competencies/outcomes below.	Direct/ Indirect	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	I	I	I	
IV.B.9. Suspension and Steering Tasks - Inspect and replace manual or power rack and pinion steering gear inner tie rod ends (sockets) and bellows boots.				X																
IV.B.10. Suspension and Steering Tasks - Inspect power steering fluid levels and condition.				X																
IV.B.11. Suspension and Steering Tasks - Flush, fill, and bleed power steering system				X																
IV.B.12. Suspension and Steering Tasks - Diagnose power steering fluid leakage; determine necessary action.				X																
IV.B.13. Suspension and Steering Tasks - Remove, inspect, replace, and adjust power steering pump belt.				X																
IV.B.14. Suspension and Steering Tasks - Remove and reinstall power steering pump.				X																

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Assessment Measures – Are direct or indirect as indicated. List competencies/outcomes below.	Direct/ Indirect	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	I	I	I	I	D	D							
IV.B.15. Suspension and Steering Tasks - Remove and reinstall power steering pump pulley; check pulley and belt alignment.					X																											
IV.B.16. Suspension and Steering Tasks - Inspect and replace power steering hoses and fittings.				X																												
IV.B.17. Suspension and Steering Tasks - Inspect and replace pitman arm, relay (centerlink/intermediate) rod, idler arm and mountings, and steering linkage damper.				X																												
IV.B.18. Suspension and Steering Tasks - Inspect, replace, and adjust tie rod ends (sockets), tie rod sleeves, and clamps.				X																												
IV.B.19. Suspension and Steering Tasks- Test and diagnose components of electronically controlled suspension systems using a scan tool; determine necessary action.				X																												

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Assessment Measures – Are direct or indirect as indicated. List competencies/outcomes below.	Direct/ Indirect	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	I	I	I	I	D	D							
IV.C.1.1. Suspension and Steering Tasks- Diagnose short and long arm type suspension system noises, body sway, and uneven riding height concerns; determine necessary action.				X																												
IV.C.1.2. Suspension and Steering Tasks- Diagnose strut suspension system noises, body sway, and uneven riding height concerns; determine necessary action.				X																												
IV.C.1.3. Suspension and Steering Tasks- remove, inspect, and install upper and lower control arms, bushings, shafts and rebound bumpers.				X																												
IV.C.1.4. Suspension and Steering Tasks- Remove, inspect, and install strut (compression/tension) rods and bushings.				X																												
IV.C.1.5. Suspension and Steering Tasks- Remove, inspect and install upper and lower ball joints.				X																												

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Assessment Measures – Are direct or indirect as indicated. List competencies/outcomes below.	Direct/ Indirect	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	I	I	I	I	D	D								
IV.C.1.6. Suspension and Steering Tasks- Remove, inspect and install steering knuckle assemblies.					X																												
IV.C.1.7. Suspension and Steering Tasks - Remove, inspect and install short and long arm suspension system coil springs and spring insulators.				X																													
IV.C.1.8. Suspension and Steering Tasks- Remove, inspect, install, and adjust suspension system torsion bars; inspect mounts.				X																													
IV.C.1.9. Suspension and Steering Tasks- Remove, inspect and install stabilizer bar bushings, brackets, and links.				X																													
IV.C.1.10. Suspension and Steering Tasks - Remove, inspect and install strut cartridge or assembly, strut coil spring, insulators, (silencers) and upper strut bearing mount.				X																													

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For each competency/outcome place an “X” below the method of assessment to be used.	Assessment of Student Learning	Article Review	Case Studies	Group Projects	Lab Work	Oral Presentations	Pre-Post Tests	Quizzes	Written Exams	Artifact Self Reflection of Growth	Capstone Projects	Comprehensive Written Exit Exam	Course Embedded Questions	Multi-Media Projects	Observation	Writing Samples	Portfolio Evaluation	Real World Projects	Reflective Journals	Applied Application (skills) Test	Oral Exit Interviews	Accreditation Reviews/Reports	Advisory Council Feedback	Employer Surveys	Graduate Surveys	Internship/Practicum /Site Supervisor Evaluation	Licensing Exam	In Class Feedback	Simulation	Interview	Written Report	Assignment
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IV.C.1.11. Suspension and Steering Tasks - Lubricate suspension/steering systems.					X																											
IV.C.2.1. Suspension and Steering Tasks- Remove, inspect and install coil springs and spring insulators.					X																											
IC.C.2.2. Suspension and Steering Tasks- Remove, inspect and replace transverse links, control arms, bushings, and mounts.					X																											
IV.C.2.3. Suspension and Steering Tasks- Remove, inspect and install leaf springs, leaf spring insulators (silencers), shackles, brackets, bushings, and mounts.					X																											
IV.C.2.4. Suspension and Steering Tasks- Remove, inspect and install strut cartridge or assembly, strut coil spring, and insulators (silencers).					X																											

ATO 1260 – Steering & Suspension Systems	Assessment Options																															
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Assessment Measures – Are direct or indirect as indicated. List competencies/outcomes below.	Direct/ Indirect	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	I	I	I	I	D	D							
IV.C.3.1. Suspension and Steering Tasks- Inspect, remove and replace shock absorbers.				X																												
IV.C.3.2. Remove, inspect, and service or replace front and rear wheel bearings.				X		X																										
IV.C.3.3. Test and diagnose components of electronically controlled suspension systems using a scan tool; determine necessary action.						X																										
IV.D.1. Suspension and Steering Tasks - Differentiate between steering and suspension concerns using principles of steering geometry (caster, camber, toe, etc).				X		X	X																									
IV.D.2. Suspension and Steering Tasks - Diagnose vehicle wander, drift, pull, hard steering, bump steer, memory steer, torque steer, and steering return concerns; determine necessary action.				X		X	X																									

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IV.D.3. Suspension and Steering Tasks - Perform pre-alignment inspection; perform necessary action.				X		X	X																									
IV.D.4. Suspension and Steering Tasks - Measure vehicle riding height; determine necessary action.				X																												
IV.D.5. Suspension and Steering Tasks - Check and adjust front and rear wheel camber; perform necessary action.				X		X	X																									
IV.D.6. Suspension and Steering Tasks - Check and adjust caster; perform necessary action.				X		X	X																									
IV.D.7. Suspension and Steering Tasks - Check and adjust front wheel toe; adjust as needed.				X		X	X																									
IV.D.8. Suspension and Steering Tasks - Center steering wheel.				X																												
IV.D.9. Suspension and Steering Tasks - Check toe out on turns (turning radius); determine necessary action.				X																												

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IV.D.10. Suspension and Steering Tasks - Check SAI (steering axis inclination) and included angle; determine necessary action.				X			X	X																								
IV.D.11. Suspension and Steering Tasks - Check and adjust rear wheel toe.				X			X	X																								
IV.D.12. Suspension and Steering Tasks - Check rear wheel thrust angle; determine necessary action.				X																												
IV.D.13. Suspension and Steering Tasks - Check for front wheel setback; determine necessary action.				X																												
IV.D.14. Suspension and Steering Tasks - Check front cradle (subframe) alignment; determine necessary action.				X																												
IV.E.1. Suspension and Steering Tasks - Diagnose tire wear patterns; determine necessary action.				X																												

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IV.E.2. Suspension and Steering Tasks - Inspect tires, check and adjust air pressure					X																											
IV.E.3. Suspension and Steering Tasks - Diagnose wheel/tire vibration, shimmy, and noise; determine necessary action.				X																												
IV.E.4. Suspension and Steering Tasks - Rotate tires according to manufacturer's recommendations.				X																												
IV.E.5. Suspension and Steering Tasks - Measure wheel, tire, axle, and hub runout; determine necessary action.				X																												
IV.E.6. Suspension and Steering Tasks - Diagnose tire pull (lead) problem; determine corrective actions.				X																												
IV.E.7. Suspension and Steering Tasks - Balance wheel and tire assembly (static and dynamic).				X																												

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IV.E.8. Suspension and Steering Tasks - Dismount, inspect, repair and remount tire on wheel.				X																												
IV.E.9. Suspension and Steering Tasks - Reinstall wheel; torque lug nuts.				X																												
IV.E.10. Suspension and Steering Tasks - Inspect and repair tire				X																												