LAUSD UNIFIED Division of Adult and Career Education

Career Technical Education (CTE) Course Outline

Course Title:	Auto Tech: Suspension & Steering
Course Number:	79-90-82
Date:	July 2024
Industry Sector:	Transportation
Pathway:	Systems Diagnostics and Service
CBEDS Title:	Advanced Automotive
CBEDS Code:	5669
Credits:	10

Hours:

Total
150

Course Description:

This competency-based course provides students with technical instruction and practical experience in an automobile area incorporating sustainable and green vehicle technologies. Instruction includes an introduction, safety-general, resource management, trade mathematics, tools and equipment, service manuals and computer-based information systems, general suspensions and steering systems diagnosis, steering systems diagnosis and repair, suspension systems diagnosis and repair, related suspension and steering service, wheel alignment diagnosis, adjustment, and repair, wheel and tire diagnosis and repair, employability skills and resume preparation, and entrepreneurial skills. The competencies in this course are aligned with the California High School Academic Content Standards and the California Career Technical Education Model Curriculum Standards.

Prerequisites:	Enrollment requires successful completion of Technology/1: Automotive Systems (79-90-83) and Technology/2: Automotive Systems (79-90-85) courses.
NOTE:	For Perkins purposes this course has been designated as a **capstone** course. This course **cannot** be repeated once a student receives a Certificate of Completion.
A-G Approval	N/A
Methods of Instruction:	Lecture and discussion, multimedia presentations, visual aids, projects individualized instruction, shop work
Student Evaluation:	Summative: End of section assessments
Industry Certification:	N/A
Recommended Texts:	Duffy, James E. Modern Automotive Technology, 10th Edition. Goodheart-Willcox Publishing, 2022. Johansson, Chris, and Martin T. Stockel. Auto Suspension and Steering Technology, 6th Edition. Goodheart-Willcox Publisher, 2025.
Link to Resource Folder	https://bit.ly/autotechsuspensionsteeringresources

Approved by: Renny L. Neyra, Executive Director

COMPETENCY AREAS AND STATEMENTS	MINIMAL COMPETENCIES	STANDARDS
A. INTRODUCTION Understand, apply, and evaluate classroom and workplace policies and procedures. (2 hours)	1. Discuss the scope and purpose of the course. 2. Discuss the classroom policies and procedures. 3. Discuss and demonstrate Zoom, Schoology, and basic computer skills. 4. Assess students' basic knowledge in suspension and steering -principles. 5. Discuss, identify, research, and draw conclusions on the different career paths, occupations, employment outlook, and career advancements in the transportation industry sector which have an impact on vehicles. 6. Discuss the opportunities available for promoting gender equity and the representation of non-traditional populations in the automotive industry. 7. Explain and recognize the importance of ethics, teamwork, respecting individual and cultural differences and diversity in the workplace. 8. Describe the role of the Automotive Service of Excellence (ASE) as it applies to the automotive industry. 9. Describe the role of the Automotive Service Education Foundation (ASEF) in auto technician training.	**Career Ready Practice:** 1, 2, 3, 4, 5, 8, 9, 10, 11 **CTE Anchor:** Academics: 1.0 Communications: 2.1, 2.3, 2.5 Career Planning & Management: 3.1, 3.4, 3.5, 3.6, 3.9 Technology: 4.1, 4.5 Problem Solving & Critical Thinking: 5.4 Ethics & Legal Responsibilities: 8.2, 8.3, 8.4, 8.5 Leadership & Teamwork: 9.3, 9.4, 9.6 Demonstration & Application: 11.1, 11.2 **CTE Pathway:** C2.6
B. SAFETY - GENERAL Understand safety procedures and techniques in the auto repair and maintenance sector.	1. Discuss classroom and workplace first aid, emergency procedures, and accidents or injury prevention. 2. Discuss the California Occupational Safety and Health Administration (Cal/OSHA) workplace requirements for auto technicians to maintain a safe and healthy working environment. 3. Discuss the impact of Environmental Protection Agency (EPA) legislation on Transportation Industry Sector practices in protecting and preserving the environment.	**Career Ready Practice:** 1, 2, 10, 12 **CTE Anchor:** Academics: 1.0 Communications: 2.1, 2.3

(3 hours)	4. Describe and demonstrate ASEF standards regarding proper handling, storage and disposal of chemicals and materials used in an auto shop. 5. Discuss the impact of California Air Resources Board (ARB) legislation on the Transportation Industry Sector. 6. Discuss the Bureau of Automotive Repair (BAR) standards for consumer and environmental protection. 7. Discuss the use of the Safety Data Sheet (SDS) as it applies to the automotive industry. 8. Discuss the safety items required by the federal, state, and local regulations. 9. Discuss the importance of proper personal hygiene in the classroom and auto shop. 10. Describe and demonstrate the standards regarding proper use of protective equipment in an auto shop: A. clothing and gloves B. respiratory gear C. eye gear D. work shoes E. ventilation F. handling, storage, and disposal of chemicals and hazardous materials used in an auto shop G. proper use of tools and equipment 11. Practice personal safety when lifting, bending, or moving equipment and supplies. 12. Pass the safety test with 100% accuracy.	Health & Safety: 6.1, 6.2, 6.3, 6.4, 6.5, 6.6, 6.7 Technical Knowledge & Skills: 10.2, 10.4 Demonstration & Application: 11.1 **CTE Pathway:** C1.2, C1.4, C2.2
C. RESOURCE MANAGEMENT Understand, apply, and evaluate the resource management principles and techniques in the auto repair and maintenance field.	1. Define and describe the benefits of the following: A. resources B. management C. sustainability D. profitability E. company growth 2. Describe and list specific examples of the effective management of the following resources in the auto shop repair and maintenance business: A. time B. materials C. personnel 3. Pass a resource management assessment with an 80% score or higher.	**Career Ready Practice:** 1, 2, 7 **CTE Anchor:** Academics: 1.0 Communications: 2.1, 2.3 Responsibility & Flexibility: 7.1, 7.4 Technical Knowledge & Skills: 10.1

(1 hour)		**CTE Pathway:** C5.2
D. TRADE MATHEMATICS Understand, apply, and evaluate the mathematical requirements used in auto diagnosis, maintenance, and the repair field. (2 hours)	1. Define and identify the practical math terminology in auto repair and maintenance. 2. Describe, demonstrate, and ask questions regarding problem-solving techniques involving: A. basic trade mathematical operations B. changing fractions to decimals C. changing decimals to fractions D. engineering notation 3. Describe, demonstrate, and interpret the English and metric units of the measuring system and draw conclusions to make informed decisions. 4. Describe and demonstrate problem-solving techniques for: A. algebraic problems B. percentages C. reading and interpreting graphs D. calculator E. geometric problems that apply to auto repair and maintenance such as angles and degrees 5. Pass a trade mathematics assessment with an 80% score or higher.	**Career Ready Practice:** 1, 2, 5, 10 **CTE Anchor:** Academics: 1.0 Communications: 2.1, 2.3 Problem Solving & Critical Thinking: 5,1, 5.2 Technical Knowledge & Skills: 10.1 Demonstration & Application: 11.1 **CTE Pathway:** C2.4
E. TOOLS AND EQUIPMENT Understand, apply, and evaluate the policies and procedures for using suspension and steering tools and equipment.	1. Define, discuss, and demonstrate the proper use, maintenance, and storage techniques for the following specialty tools and equipment for steering and suspension: A. hand tools B. equipment C. specialty tools and equipment for steering and suspension systems: i. ball joint press and other special tools ii. brake pedal depressor iii. bushing driver set iv. coil spring compressor tool v. constant velocity joint (CV) service tools: 1. installation tool 2. boot clamp pliers or crimping ring vi. chassis ear/stethoscope (recommended) vii. hand grease gun viii. inner tie rod end tool	**Career Ready Practice:** 1, 2, 10 **CTE Anchor:** Academics: 1.0 Communications: 2.1, 2.3 Health & Safety: 6.4 Technical Knowledge & Skills: 10.1 Demonstration & Application: 11.1

(6 hours)	ix. pitman arm puller x. power steering pump pulley special tool set (appropriate for units being taught) xi. power steering pressure gauges (recommended) xii. shock absorber/strut tools xiii. strut spring compressor tool xiv. steering column special tool set (appropriate for teaching units being utilized) xv. tie rod puller xvi. tire mounting machine (rim clamp type) xvii. tire patching tools and supplies xviii. Tire Pressure Monitor System (TPMS) scan tool xix. wheel alignment equipment-4 wheel (including alignment tools) xx. wheel balancer – electronic type xxi. wheel weight pliers 2. Explain and demonstrate the following: A. selection of the appropriate hand, power tools, and equipment for each job B. procedure for checking out hand, power tools, and equipment from the tool room C. safe use of the most common hand, power tools and equipment in the auto shop D. practice personal safety when lifting, bending, or moving equipment and supplies 3. Pass a tools and equipment assessment with an 80% score or higher.	**CTE Pathway:** C2.2, C2.3
F. SERVICE MANUALS AND COMPUTER-BASED INFORMATION SYSTEMS Understand, apply, and evaluate the contents of service manuals and computer-based information systems as important sources of reference to an auto technician.	1. Identify the different types of service manuals. 2. State the different types of information that can be found in service manuals such as specifications, troubleshooting charts, and repair information. 3. Describe and demonstrate the use of service manuals. 4. Describe and demonstrate the use of web-based search engines in finding automotive technical information. 5. Explain the advantages of using web-based search engines over service manuals in finding automotive technical information. 6. Complete work order to include customer information, vehicle identifying information,	**Career Ready Practice:** 1, 2, 4, 10, 11 **CTE Anchor:** Academics: 1.0 Communications: 2.1, 2.3 Technology: 4.1, 4.2 Demonstration & Application: 11.1

(2 hours)	customer concern, related service history, cause, and correction. 7. Pass a service manual and computer-based information system assessment with an 80% score or higher.	**CTE Pathway:** C2.6, C4.3, C4.4
G. GENERAL SUSPENSION AND STEERING SYSTEM DIAGNOSIS Understand, apply, and evaluate the general diagnostic techniques for the suspension and steering systems according to manufacturer's specifications. (12 hours)	1. Demonstrate how to complete the work order to include customer information, vehicle identifying information, customer concern, related service history, cause, and correction. 2. Identify and interpret suspension and steering systems concerns; determine necessary action. 3. Form teams to research applicable vehicle and service information such as: A. suspension and steering systems and operations B. vehicle service history C. service precautions D. technical service bulletins 4. Locate and interpret vehicle identification such as: vehicle identification numbers, differentials, suspension parts, and other major components. 5. Pass a general suspension and steering system diagnosis assessment with an 80% score or higher.	**Career Ready Practice:** 1, 2, 4, 5, 9, 10 **CTE Anchor:** Academics: 1.0 Communications: 2.1, 2.3, 2.5 Technology: 4.2 Problem Solving & Critical Thinking: 5.1, 5.3, 5.4 Leadership & Teamwork: 9.3, 9.7 Technical Knowledge & Skills: 10.1 Demonstration & Application: 11.1 **CTE Pathway:** C2.6, C4.1, C4.2, C4.3, C4.4
H. STEERING SYSTEMS DIAGNOSIS AND REPAIR Understand, apply, and evaluate the diagnostic and repair techniques for steering systems according to the manufacturer's specifications.	1. Disable and enable supplemental restraint system (SRS). 2. Remove and center the replace steering wheel; center/time SRS coil (clock spring). 3. Form teams to diagnose steering column noises, looseness, and binding concerns (including tilt mechanisms); determine necessary action. 4. Diagnose linkage power steering gear box for binding, uneven turning effort, looseness, hard steering, and noise concerns; determine necessary action.	**Career Ready Practice:** 1, 2, 4, 5, 9, 10 **CTE Anchor:** Academics: 1.0 Communications: 2.1, 2.3, 2.5 Technology: 4.2

(35 hours)	5. Diagnose rack and pinion power steering for binding, uneven turning effort, looseness, hard steering, and noise concerns; determine necessary action. 6. Diagnose power steering gear (non-rack and pinion) binding, uneven turning effort, looseness, hard steering, and noise concerns; determine necessary action. 7. Inspect steering shaft universal joint(s), flexible coupling(s), collapsible column, lock cylinder mechanism, and steering wheel; perform necessary action. 8. Adjust linkage manual/power steering gear box for worm bearing preload and sector lash. 9. Remove and replace rack and pinion steering gear; inspect mounting bushings and brackets. 10. Inspect and replace rack and pinion steering gear inner (sockets) outer tie rod ends and bellows boots. 11. Determine proper power steering fluid type; inspect fluid level and condition. 12. Demonstrate how to flush, fill, and bleed power steering system. 13. Diagnose power steering fluid leakage; determine necessary action. 14. Remove, inspect, replace, and adjust power steering pump belt. 15. Remove and reinstall power steering pump. 16. Remove and reinstall press fit power steering pump pulley; check pulley and belt alignment. 17. Inspect and replace power steering hoses and fittings. 18. Inspect and replace pitman arm, relay (center link/intermediate) rod, idler arm and mountings, and steering linkage damper. 19. Inspect, replace, and adjust tie rod ends,, tie rod sleeves, and clamps. 20. Test and diagnose components of electronically controlled steering systems using a scan tool; determine necessary action. 21. Inspect and test electric power assist steering. 22. Identify hybrid vehicle power steering system electrical circuits, service, and safety precautions. 23. Pass a steering systems diagnosis and repair assessment with an 80% score or higher.	Problem Solving & Critical Thinking: 5.1, 5.3, 5.4 Leadership & Teamwork: 9.3, 9.7 Demonstration & Application: 11.1 **CTE Pathway:** C2.2, C2.5, C3.3, C3.5, C5.6, C7.7, C8.1, C8.4, C8.5

I. SUSPENSION SYSTEMS DIAGNOSIS AND REPAIR Understand, apply, and evaluate the diagnostic and repair techniques for suspension systems according to the manufacturer's specifications. (30 hours)	1. Diagnose short and long arm suspension system noises, body sway, and uneven ride height concerns; determine necessary action. 2. Form teams to diagnose strut suspension system noises, body sway, and uneven ride height concerns; determine necessary action. 3. Demonstrate, remove, inspect, install, and adjust where applicable: A. upper and lower control arms, bushings, shafts, and rebound bumpers B. strut rods and bushings C. upper and/or lower ball joints D. steering knuckle assemblies E. short and long arm suspension system coil springs and spring insulators F. adjust suspension system torsion bars; inspect mounts G. stabilizer bar bushings, brackets, and links H. strut cartridge or assembly, strut coil spring, insulators (silencers), and upper strut bearing mount I. leaf springs, leaf spring insulators (silencers), shackles, brackets, bushings, and mounts 4. Pass a suspension systems diagnosis and repair assessment with an 80% score or higher.	**Career Ready Practice:** 1, 2, 4, 5, 9, 10 **CTE Anchor:** Academics: 1.0 Communications: 2.1, 2.3, 2.5 Technology: 4.2 Problem Solving & Critical Thinking: 5.3, 5.4 Leadership & Teamwork: 9.3, 9.7 Demonstration & Application: 11.1 **CTE Pathway:** C2.2, C2.5, C5.6, C8.1, C8.4, C8.5, C8.6
J. RELATED SUSPENSION AND STEERING SERVICE Understand, apply, and evaluate the service techniques for the related suspension and steering system components according to the manufacturer's specifications.	1. Inspect, remove, and replace shock absorbers. 2. Remove, inspect, and service or replace front and rear wheel bearings. 3. Demonstrate how to test and diagnose components of electronically controlled suspension systems using a scan tool and reference materials; determine necessary action. 4. Form teams to diagnose, inspect, adjust, repair, or replace components of electronically controlled steering systems (including sensors, switches, and actuators); initialize systems as required. 5. Describe the function of the idle speed compensation switch. 6. Lubricate suspension and steering systems. 7. Pass a related suspension and steering service assessment with an 80% score or higher.	**Career Ready Practice:** 1, 2, 4, 5, 9, 10 **CTE Anchor:** Academics: 1.0 Communications: 2.1, 2.3, 2.5 Technology: 4.1, 4.2 Problem Solving & Critical Thinking: 5.3, 5.4 Leadership & Teamwork: 9.3, 9.7 Demonstration & Application:

(12 hours)		11.1 **CTE Pathway:** C2.5, C3.3, C3.7, C5.6, C8.1, C8.4, C8.6
K. WHEEL ALIGNMENT DIAGNOSIS, ADJUSTMENT, AND REPAIR Understand, apply, and evaluate the wheel alignment diagnosis, adjustment, and repair techniques according to the manufacturer's specifications. (24 hours)	1. Demonstrate how to diagnose vehicle wander, drift, pull, hard steering, bump steer, memory steer, torque steer, and steering return concerns; determine necessary action. 2. Form teams to perform pre-alignment inspection and measure vehicle ride height; perform necessary action. 3. Form teams to prepare the vehicle for wheel alignment on the alignment machine; perform four-wheel alignment by checking and adjusting front and rear wheel caster, camber; and toe as required; center steering wheel. 4. Check and adjust toe-out-on-turns (turning radius) and use appropriate personal protective equipment; determine necessary action. 5. Check components related to steering axis inclination (SAI) and included angle; determine necessary action. 6. Check rear wheel thrust angle; determine necessary action. 7. Check for front wheel setback; determine necessary action. 8. Check front and/or rear cradle (subframe) alignment; determine necessary action. 9. Pass a wheel alignment diagnosis, adjustment, and repair assessment with an 80% score or higher.	**Career Ready Practice:** 1, 2, 4, 5, 9, 10 **CTE Anchor:** Academics: 1.0 Communications: 2.1, 2.3, 2.5 Technology: 4.2 Problem Solving & Critical Thinking: 5.1, 5.3, 5.4 Leadership & Teamwork: 9.3, 9.7 Demonstration & Application: 11.1 **CTE Pathway:** C1.4, C2.1, C2.2, C8.4, C8.5, C8.6
L. WHEEL AND TIRE DIAGNOSIS AND REPAIR Understand, apply, and evaluate the diagnostic and repair techniques for the wheels and tires according to the manufacturer's specifications.	1. Demonstrate how to inspect tire condition; identify tire wear patterns; check and adjust air pressure; determine necessary action. 2. Form teams to diagnose wheel/tire vibration, shimmy, and noise; determine necessary action. 3. Rotate tires according to manufacturer's recommendations. 4. Measure wheel, tire, axle flange, and hub runout; determine necessary action. 5. Diagnose tire pull problems; determine necessary action.	**Career Ready Practice:** 1, 2, 4, 5, 9, 10 **CTE Anchor:** Academics: 1.0 Communications: 2.1, 2.3, 2.5 Technology: 4.1, 4.2

(12 hours)	6. Dismount, inspect, and remount tire on wheel; balance wheel and tire assembly (static and dynamic). 7. Dismount, inspect, and remount tire on wheel equipped with tire pressure monitoring system sensor. 8. Reinstall wheel; torque lug nuts. 9. Inspect tire and wheel assembly for air loss; perform necessary action. 10. Repair tire using internal patch. 11. Inspect, diagnose, repair, and clone or reprogram tire pressure monitoring system. 12. Pass a wheel and tire diagnosis and repair assessment with an 80% score or higher.	Problem Solving & Critical Thinking: 5.1, 5.2, 5.3, 5.4 Leadership & Teamwork: 9.3, 9.7 Demonstration & Application: 11.1 **CTE Pathway:** C2.1, C2.2, C4,3, C8.4, C8.5
M. EMPLOYABILITY SKILLS AND RESUME PREPARATION Understand, apply, and evaluate the employability skills and resume preparation desired of automotive technicians.	1. Understand and define employer requirements for soft skills such as: A. attitude toward work B. communication and collaboration C. critical thinking, problem solving, and decision-making D. customer service E. diversity in the workplace F. flexibility and adaptability G. interpersonal skills H. leadership and responsibility I. punctuality and attendance J. quality of work K. respect, cultural and diversity differences L. teamwork M. time management N. trust and ethical behavior O. work ethic 2. Develop a career plan that reflects career interests, pathways, and post-secondary options. 3. Create/revise a resume, cover letter and/or portfolio. 4. Demonstrate, analyze, research, and review the role of online job searching platforms and career websites to make informed decisions. 5. Understand the importance of assessing social media account content for professionalism.	**Career Ready Practice:** 1, 2, 3, 4, 5, 7, 8, 9, 10, 11 **CTE Anchor:** Academics: 1.0 Communications: 2.1, 2.3, 2.4. 2.5 Career Planning & Management: 3.1, 3.2, 3.3, 3.4, 3.5, 3.6, 3.8, 3.9 Technology: 4.1, 4.2, 4.3, 4.5 Problem Solving & Critical Thinking: 5.1, 5.4 Responsibility & Flexibility: 7.2, 7.3, 7.4, 7.7 Ethics & Legal Responsibilities: 8.3, 8.4, 8.5 Leadership & Teamwork: 9.1, 9.2, 9.3, 9.4, 9.6, 9.7 Technical Knowledge & Skills:

(4 hours)	6. Demonstrate and complete and/or review an on-line job application. 7. Understand and demonstrate interview skills to get the job: A. do's and don'ts for job interviews B. how to dress for the job 8. Demonstrate and create sample follow-up letters. 9. Understand the importance of the continuous upgrading of job skills as it relates to: A. certification, licensure, and/or renewal B. professional organizations/events C. industry associations and/or organized labor	10.1, 10.3 Demonstration & Application: 11.1, 11.2, 11.5 **CTE Pathway:** C5.4, C5.5
N. ENTREPRENEURIAL SKILLS Understand, apply, and evaluate the process involved in becoming an entrepreneur in the automotive industry. (5 hours)	1. Define entrepreneurship. 2. Identify and research the necessary characteristics of successful entrepreneurs. 3. Examine personal goals prior to starting a business. 4. Evaluate sources of monetary investment in a business opportunity. 5. Explain licensing/permit requirements for a business. 6. Explain how the Small Business Administration (SBA) assists entrepreneurs with lenders and funding to help them plan, start and grow a business. 7. Demonstrate a budget to identify start-up expenses. 8. Pass an entrepreneurial skills assessment with an 80% score or higher.	**Career Ready Practice:** 1, 2, 4, 10, 11 **CTE Anchor:** Academics: 1.0 Communications: 2.1, 2.3, 2.5 Technology: 4.1, 4.2, 4.5 Responsibility & Flexibility: 7.1, 7.6 Technical Knowledge & Skills: 10.1, 10.3, 10.4 Demonstration & Application: 11.1, 11.2, 11.3, 11.4, **CTE Pathway:** C5.1, C5.2, C5.3, C5.5

ACKNOWLEDGEMENTS

Thanks to the following individuals for their contributions in developing and editing this curriculum:

Ana Martinez, Victor Lerma, Seyed Saidi, and Juan Soltero