

**Transportation, Distribution and Logistics Career Cluster
Maintenance and Light Repair 2
Course Number 47.53210**

Course Description:

Students will learn the basic skills needed to gain employment as a maintenance and light repair technician and will expose students to automotive preventative maintenance and servicing, as well as replacing brakes, and steering and suspension components. Students will also learn general electrical system diagnosis, electrical theory, basic test requirements, and determining necessary action. In addition, students will learn how to evacuate and recharge air-conditioning systems using the proper refrigerant. Standards for this course are aligned with ASE/NATEF standards and are an excellent foundation for the entry-level technician. The prerequisite for this course is Basic Maintenance and Light Repair.

Course Standard 1

TDL-MLR2-1

The following standard is included in all CTAE courses adopted for the Career Cluster/Pathways. Teachers should incorporate the elements of this standard into lesson plans during the course. The topics listed for each element of the standard may be addressed in differentiated instruction matching the content of each course. These elements may also be addressed with specific lessons from a variety of resources. This content is not to be treated as a unit or separate body of knowledge but rather integrated into class activities as applications of the concept.

Standard: Demonstrate employability skills required by business and industry.

The following elements should be integrated throughout the content of this course.

1.1 Communicate effectively through writing, speaking, listening, reading, and interpersonal abilities.

Person-to-Person Etiquette	Telephone and Email Etiquette	Cell Phone and Internet Etiquette	Communicating At Work	Listening
Interacting with Your Boss	Telephone Conversations	Using Blogs	Improving Communication Skills	Reasons, Benefits, and Barriers
Interacting with Subordinates	Barriers to Phone conversations	Using Social Media	Effective Oral Communication	Listening Strategies
Interacting with Co-workers	Making and Returning Calls		Effective Written Communication	Ways We Filter What We Hear
Interacting with Suppliers	Making Cold Calls		Effective Nonverbal Skills	Developing a Listening Attitude
	Handling Conference Calls		Effective Word Use	Show You Are Listening
	Handling Unsolicited Calls		Giving and Receiving Feedback	Asking Questions
				Obtaining Feedback
				Getting Others to Listen

Nonverbal Communication	Written Communication	Speaking	Applications and Effective Résumés
Communicating Nonverbally	Writing Documents	Using Language Carefully	Completing a Job Application
Reading Body Language and mixed Messages	Constructive Criticism in Writing	One-on-One Conversations	Writing a Cover Letter

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Matching Verbal and Nonverbal communication		Small Group Communication	Things to Include in a Résumé
Improving Nonverbal Indicators		Large Group Communication	Selling Yourself in a Résumé
Nonverbal Feedback		Making Speeches	Terms to Use in a Résumé
Showing Confidence Nonverbally		Involving the Audience	Describing Your Job Strengths
Showing Assertiveness		Answering Questions	Organizing Your Résumé
		Visual and Media Aids	Writing an Electronic Résumé
		Errors in Presentation	Dressing Up Your Résumé

1.2 Demonstrate creativity by asking challenging questions and applying innovative procedures and methods.

Teamwork and Problem Solving	Meeting Etiquette
Thinking Creatively	Preparation and Participation in Meetings
Taking Risks	Conducting Two-Person or Large Group Meetings
Building Team Communication	Inviting and Introducing Speakers
	Facilitating Discussions and Closing
	Preparing Visual Aids
	Virtual Meetings

1.3 Exhibit critical thinking and problem solving skills to locate, analyze and apply information in career planning and employment situations.

Problem Solving	Customer Service	The Application Process	Interviewing Skills	Finding the Right Job
Transferable Job Skills	Gaining Trust and Interacting with Customers	Providing Information, Accuracy and Double Checking	Preparing for an Interview	Locating Jobs and Networking
Becoming a Problem Solver	Learning and Giving Customers What They Want	Online Application Process	Questions to Ask in an Interview	Job Shopping Online
Identifying a Problem	Keeping Customers Coming Back	Following Up After Submitting an Application	Things to Include in a Career Portfolio	Job Search Websites
Becoming a Critical Thinker	Seeing the Customer's Point	Effective Résumés:	Traits Employers are Seeking	Participation in Job Fairs
Managing	Selling Yourself and the Company	Matching Your Talents to a Job	Considerations Before Taking a Job	Searching the Classified Ads
	Handling Customer Complaints	When a Résumé Should be Used		Using Employment Agencies
	Strategies for Customer Service			Landing an Internship
				Staying Motivated to Search

1.4 Model work readiness traits required for success in the workplace including integrity, honesty, accountability, punctuality, time management, and respect for diversity.

Workplace Ethics	Personal Characteristics	Employer Expectations	Business Etiquette	Communicating at Work
Demonstrating Good Work Ethic	Demonstrating a Good Attitude	Behaviors Employers Expect	Language and Behavior	Handling Anger
Behaving Appropriately	Gaining and Showing Respect	Objectionable Behaviors	Keeping Information Confidential	Dealing with Difficult Coworkers

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Maintaining Honesty	Demonstrating Responsibility	Establishing Credibility	Avoiding Gossip	Dealing with a Difficult Boss
Playing Fair	Showing Dependability	Demonstrating Your Skills	Appropriate Work Email	Dealing with Difficult Customers
Using Ethical Language	Being Courteous	Building Work Relationships	Cell Phone Etiquette	Dealing with Conflict
Showing Responsibility	Gaining Coworkers' Trust		Appropriate Work Texting	
Reducing Harassment	Persevering		Understanding Copyright	
Respecting Diversity	Handling Criticism		Social Networking	
Making Truthfulness a Habit	Showing Professionalism			
Leaving a Job Ethically				

1.5 Apply the appropriate skill sets to be productive in a changing, technological, diverse workplace to be able to work independently and apply team work skills.

Expected Work Traits	Teamwork	Time Management
Demonstrating Responsibility	Teamwork Skills	Managing Time
Dealing with Information Overload	Reasons Companies Use Teams	Putting First Things First
Transferable Job Skills	Decisions Teams Make	Juggling Many Priorities
Managing Change	Team Responsibilities	Overcoming Procrastination
Adopting a New Technology	Problems That Affect Teams	Organizing Workspace and Tasks
	Expressing Yourself on a Team	Staying Organized
	Giving and Receiving Constructive Criticism	Finding More Time
		Managing Projects
		Prioritizing Personal and Work Life

1.6 Present a professional image through appearance, behavior and language.

On-the-Job Etiquette	Person-to-Person Etiquette	Communication Etiquette	Presenting Yourself
Using Professional Manners	Meeting Business Acquaintances	Creating a Good Impression	Looking Professional
Introducing People	Meeting People for the First Time	Keeping Phone Calls Professional	Dressing for Success
Appropriate Dress	Showing Politeness	Proper Use of Work Email	Showing a Professional Attitude
Business Meal Functions		Proper Use of Cell Phone	Using Good Posture
Behavior at Work Parties		Proper Use in Texting	Presenting Yourself to Associates
Behavior at Conventions			Accepting Criticism
International Etiquette			Demonstrating Leadership
Cross-Cultural Etiquette			
Working in a Cubicle			

Support of CTAE Foundation Course Standards and Georgia Standards of Excellence L9-10RST 1-10 and L9-10WHST 1-10:

Georgia Standards of Excellence ELA/Literacy standards have been written specifically for technical subjects and have been adopted as part of the official standards for all CTAE courses.

Course Standard 2

TDL-MLR2-2

Identify and accurately utilize safety procedures and proper tools.

- 2.1. Identify and demonstrate proper general shop safety rules and procedures.
- 2.2 Identify and demonstrate proper safe procedures for handling of tools and equipment.
- 2.3 Identify and demonstrate the proper procedures for placement of floor jacks and jack stands.
- 2.4 Identify and demonstrate the proper procedures for safe lift operation.
- 2.5 Identify and demonstrate the proper ventilation procedures for working within the lab/shop area.
- 2.6 Identify and demonstrate the proper procedures for marked safety areas.
- 2.7 Identify and describe the location and use of types of fire extinguishers and other fire safety equipment.
- 2.8 Identify and describe the location and use of eye wash stations.
- 2.9 Identify and describe the location of the posted evacuation routes.
- 2.10 Demonstrate the proper required use of safety glasses, ear protection, gloves, and shoes during lab/shop activities.
- 2.11 Identify and demonstrate the proper use of appropriate clothing for lab/shop activities.
- 2.12 Demonstrate the proper method of securing hair and jewelry for lab/shop activities.
- 2.13 Demonstrate the proper use of safety aspects of supplemental restraint systems (SRS), electronic brake control systems, and hybrid vehicle high voltage circuits.
- 2.14 Demonstrate the proper use of safety aspects of high voltage circuits (such as high intensity discharge (HID) lamps, ignition systems, injection systems, etc.).
- 2.15 Locate and demonstrate the proper use of material safety data sheets (MSDS).

Course Standard 3

TDL-MLR2-3

Identify and utilize proper tools and equipment.

- 3.1 Identify and demonstrate proper use of tools practiced in automotive applications.
- 3.2 Identify and interpret the proper use of standard and metric designation.
- 3.3 Demonstrate the proper safe handling and use of appropriate tools.
- 3.4 Demonstrate the proper cleaning, storage, and maintenance of tools and equipment.
- 3.5 Demonstrate the proper use of precision measuring tools (e.g., micrometer, dial-indicator, and dial-caliper).

Course Standard 4

TDL-MLR2-4

Identify and utilize vehicle service information.

- 4.1 Demonstrate preparing a vehicle for service by identifying and using information needed, including the service requested on a repair order.
- 4.2 Illustrate the purpose and use of fender covers and mats.
- 4.3 Distinguish between proper use of the three C's (concern, cause, and correction) to prepare a vehicle for service.

- 4.4 Research and evaluate vehicle service history related to completing a work order that includes customer information, vehicle identifying information, customer concern, related service history, cause, and correction.
- 4.5 Identify and report how a vehicle is prepared to return to customer per school/company policy (floor mats, steering wheel cover, etc.).

Course Standard 5

TDL-MLR2-5

Demonstrate general engine service techniques (Engine Repair General).

- 5.1 Demonstrate the proper installation of engine covers using gaskets, seals, and sealers, as required. [NATEF I-A-4]
- 5.2 Demonstrate the proper methods required in common fastener and thread repair performance, including removing a broken bolt, restoring internal and external threads, and repairing internal threads with thread insert. [NATEF I-A-6]
- 5.3 Inspect and determine the necessary action required to perform cooling system pressure and dye tests to identify leaks, check coolant condition and level; and test the radiator, pressure cap, coolant recovery tank, and heater core. [NATEF O-C-1]
- 5.4 Demonstrate the proper method of removal, inspection and replacement of a thermostat and gasket/seal. [NATEF I-C-E]

Course Standard 6

TDL-MLR2-6

Apply concepts to perform general automatic transmission & manual transaxle & differential service.

- 6.1 Apply concepts learned to properly inspect, replace, and align power train mounts for an in-vehicle automatic transmission/transaxle. [NATEF II-B-3]
- 6.2 Apply concepts learned to drain and replace in-vehicle automatic transmission/transaxle fluid and filter(s). [NATEF II-B-4]

Course Standard 7

TDL-MLR2-7

Apply concepts to prepare a vehicle for general suspension and steering systems service.

- 7.1 Identify and perform a proper inspection of rack and pinion steering gear inner tie rod ends (sockets) and bellows boots for suspension and steering systems and related suspension and steering service. [NATEF VI-B-1]
- 7.2 Identify and perform the proper removal, inspection, replacement, and adjustment of a power steering pump drive belt. [NATEF IV-B-5]
- 7.3 Identify and perform a proper inspection of a pitman arm, relay (centerlink/intermediate) rod, idler arm and mountings, and steering linkage damper. [NATEF IV-B-7]
- 7.4 Identify and perform a proper inspection of tie rod ends (sockets), tie rod sleeves, and clamps. [NATEF IV-B-8]
- 7.5 Identify and perform a proper inspection of upper and lower control arms, bushings, and shafts. [NATEF IV-B-9]
- 7.6 Identify and perform a proper inspection and replacement of rebound and jounce bumpers. [NATEF IV-B-10]
- 7.7 Identify and properly inspect track bar, strut rods/radius arms, and related mounts and bushings. [NATEF IV-B-11]

- 7.8 Identify and perform a proper inspection of upper and lower ball joints (with or without wear indicators). [NATEF IV-B-12]
- 7.9 Identify and perform a proper inspection of suspension system coil springs and spring insulators (silencers). [NATEF IV-B-13]
- 7.10 Identify and perform a proper inspection and replacement of front stabilizer bar (sway bar) bushings, brackets, and links. [NATEF IV-B-15]
- 7.11 Identify and perform a proper inspection of rear suspension system lateral links/arms (track bars), control (trailing) arms. [NATEF IV-B-18]
- 7.12 Identify and perform a proper inspection, removal, and replacement of shock absorbers; inspect mounts and bushings. [NATEF IV-B-20]
- 7.13 Identify and describe the proper function of the power steering pressure switch. [NATEF IV-B-23]

Course Standard 8

TDL-MLR2-8

Perform hydraulic brake system service and repairs.

- 8.1 Describe the proper procedure and perform a road test to check brake system operation, including an anti-lock brake system. [NATEF V-B-2]
- 8.2 Demonstrate and perform the proper procedure in checking the master cylinder for external leaks and proper operation. [NATEF B-B-2]
- 8.3 Determine the necessary action required after inspecting brake lines, flexible hoses, and fittings for leaks, dents, kinks, rust, cracks, bulging, wear, loose fittings and supports.
- 8.4 Identify, explain, and describe components of the brake warning light system. [NATEF V-B-5]
- 8.5 Identify, explain, and perform the proper procedure to Bleed and/or flush the brake systems. [NATEF V-B-6]
- 8.6 Identify, explain, and perform the proper procedure to test brake fluid for contamination. [NATEF IV-B-7]
- 8.7 Determine the necessary action required after removing, cleaning, inspecting, and measuring brake drum diameter. [NATEF IV-C-3]
- 8.8 Identify, explain, and perform the proper procedure to refinish the brake drum and measure final drum diameter and compare with specifications. [NATEF IV-C-2]
- 8.9 Identify, explain and perform the proper procedure to lubricate and reassemble after removing, cleaning, and inspect brake shoes, springs, pins, clips, levers, adjusters/self-adjusters, and other related brake hardware, backing support plates. [NATEF IV-C-3]
- 8.10 Explain and perform the proper procedure to remove and replace wheel cylinders for leaks and proper operation. [NATEF V-C-4]
- 8.11 Explain and perform the proper procedure to pre-adjust brake shoes and parking brake, install brake drums or drum/hub assemblies and wheel bearings, and conduct final checks and adjustments. [NATEF V-C-5]
- 8.12 Determine the proper procedure required for disc brakes after removing and cleaning caliper assembly and inspecting for leaks and damage/wear to the caliper housing. [NATEF V-D-1]
- 8.13 Determine the proper procedure required after cleaning and inspecting the caliper mounting and slides/pins for proper operation, wear, and damage. [NATEF V-D-2]
- 8.14 Determine the proper procedure required after removing, inspecting, and replacing pads and retaining hardware. [NATEF V-D-3]
- 8.15 Explain and determine the necessary action required to lubricate and reinstall caliper, pads, and related hardware; seat pads and inspect for leaks. [NATEF V-D-4]
- 8.16 Explain and determine necessary action after cleaning and inspecting the rotor, measuring rotor thickness, variation, and lateral run out. [NATEF V-D-5]

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- 8.17 Explain and determine the proper procedure to remove and reinstall rotor. [NATEF V-D-6]
- 8.18 Compare with specifications after refinishing the rotor on the vehicle and measuring the final rotor thickness. [NATEF V-D-7]
- 8.19 Compare with specifications after refinishing the rotor off vehicle and measuring the final rotor thickness. [NATEF V-D-8]
- 8.20 Explain and perform the proper procedure to retract and re-adjust caliper piston on an integral parking brake system. [NATEF V-D-8]
- 8.21 Determine the necessary action required after checking the brake pad wear indicator. [NATEF V-D-10]
- 8.22 Describe the importance of operating the vehicle to burnish/break-in replacement brake pads according to the manufacturer's recommendations. [NATEF V-D-11]
- 8.23 Explain and perform the proper procedure to check vacuum supply (manifold or auxiliary pump) to vacuum-type power booster. [NATEF V-E-2]
- 8.24 Explain and perform the proper procedure to remove, clean, inspect, repack, install wheel bearings, as well as replace seals, install hub and adjust bearings. [NATEF V-F-3]
- 8.25 Explain and perform the proper procedure to clean, lubricate and adjust or replace after checking the parking brake cables and components for wear, binding, and corrosion. [NATEF V-F-5]
- 8.26 Explain and perform the proper procedure to replace the wheel bearing and race. [NATEF V-F-5]

Course Standard 9

TDL-MLR2-9

Perform general electrical systems service.

- 9.1 Demonstrate knowledge of electrical/electronic series, parallel, and series-parallel circuits using principles of electricity (Ohm's Law). [NATEF VI-A-2]
- 9.2 Determine necessary action after inspecting and testing fusible links, circuit breakers, and fuses. [NATEF VI-A-9]
- 9.3 Explain and perform the proper procedure to solder repair of electric wiring. [NATEF VI-A-10]
- 9.4 Explain and perform proper identification of electronic modules, security systems, radios, and other accessories that require reinitialization or code entry after reconnecting the vehicle battery. [NATEF VI-B-8]
- 9.5 Determine and perform the necessary action required after performing the starter current draw test. [NATEF VI-C-1]
- 9.6 Determine necessary action after performing the starter circuit voltage drop tests. [NATEF VI-C-2]
- 9.7 Determine necessary action after performing a charging system output test. [NATEF VI-D-1]
- 9.8 Check pulley and belt alignment and tensioners for wear after inspecting, adjusting, or replacing the generator (alternator) drive belts. [NATEF VI-D-2]
- 9.9 Determine necessary action after performing a charging circuit voltage drop test. [NATEF VI-D-4]
- 9.10 Disable and enable airbag system for vehicle service and verify the indicator lamp operation. [NATEF F-1]

Course Standard 10

TDL-MLR2-10

Demonstrate knowledge of air conditioning systems.

- 10.1 Determine necessary action after inspecting the air conditioning condenser for airflow restrictions. [NATEF VII-B-3]

Course Standard 11

TDL-MLR2-11

Perform fuel, air induction, and exhaust systems service and repair.

- 11.1 Determine the need to repair or replace after inspecting the condition of the exhaust system hangers, brackets, clamps, and heat shields. [NATEF VIII-C-4]
- 11.2 Check and refill the diesel exhaust fluid. [NATEF VIII-C-5]

Course Standard 12

TDL-MLR2-12

Examine how SkillsUSA is a co-curricular part of career and technical education through leadership development, school and community service projects, and competitive events.

- 12.1 Explain the purpose, mission, objectives, motto, colors, official dress and other distinguishing characteristics of SkillsUSA.
- 12.2 Explain how participation in SkillsUSA can promote lifelong responsibility for community service, professional growth and development.
- 12.3 Explore the impact and opportunities that SkillsUSA can develop to bring business and industry together with education in a positive working relationship through innovative leadership and career development programs.
- 12.4 Explore the local, state, and national opportunities available to students through participation in SkillsUSA, including, but not limited to conferences, competitions, community service, philanthropy, and other SkillsUSA activities.