Course Description:
Students in this course will learn the basic skills needed to gain employment as a maintenance and light repair technician and will expose students to courses in automotive preventative maintenance, servicing and replacing brakes, and steering and suspension components. The students will also learn how to do general electrical system diagnosis, learn about electrical theory, and perform basic tests to determine necessary action. In addition, students will learn how to evacuate and recharge air-conditioning systems using the proper refrigerant. The hours completed in this course are aligned with ASE/NATEF standards and are an excellent foundation for an entry-level technician. The pre-requisite for this course is Automobile Service Technology 4.

Course Standard 1
TDL-AST5-1
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.

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

<table>
<thead>
<tr>
<th>Nonverbal Communication</th>
<th>Written Communication</th>
<th>Speaking</th>
<th>Applications and Effective Résumés</th>
</tr>
</thead>
<tbody>
<tr>
<td>Communicating Nonverbally</td>
<td>Writing Documents</td>
<td>Using Language Carefully</td>
<td>Completing a Job Application</td>
</tr>
<tr>
<td>Reading Body Language and mixed Messages</td>
<td>Constructive Criticism in Writing</td>
<td>One-on-One Conversations</td>
<td>Writing a Cover Letter</td>
</tr>
</tbody>
</table>
### 1.2 Demonstrate creativity by asking challenging questions and applying innovative procedures and methods.

<table>
<thead>
<tr>
<th>Teamwork and Problem Solving</th>
<th>Meeting Etiquette</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thinking Creatively</td>
<td>Preparation and Participation in Meetings</td>
</tr>
<tr>
<td>Taking Risks</td>
<td>Conducting Two-Person or Large Group Meetings</td>
</tr>
<tr>
<td>Building Team Communication</td>
<td>Inviting and Introducing Speakers</td>
</tr>
<tr>
<td></td>
<td>Facilitating Discussions and Closing</td>
</tr>
<tr>
<td></td>
<td>Preparing Visual Aids</td>
</tr>
<tr>
<td></td>
<td>Virtual Meetings</td>
</tr>
</tbody>
</table>

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

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

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

<table>
<thead>
<tr>
<th>Workplace Ethics</th>
<th>Personal Characteristics</th>
<th>Employer Expectations</th>
<th>Business Etiquette</th>
<th>Communicating at Work</th>
</tr>
</thead>
<tbody>
<tr>
<td>Demonstrating Good Work Ethic</td>
<td>Demonstrating a Good Attitude</td>
<td>Behaviors Employers Expect</td>
<td>Language and Behavior</td>
<td>Handling Anger</td>
</tr>
<tr>
<td>Behaving Appropriately</td>
<td>Gaining and Showing Respect</td>
<td>Objectionable Behaviors</td>
<td>Keeping Information Confidential</td>
<td>Dealing with Difficult Coworkers</td>
</tr>
<tr>
<td>Maintaining Honesty</td>
<td>Demonstrating Responsibility</td>
<td>Establishing Credibility</td>
<td>Avoiding Gossip</td>
<td>Dealing with a Difficult Boss</td>
</tr>
</tbody>
</table>
### 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.

<table>
<thead>
<tr>
<th>Expected Work Traits</th>
<th>Teamwork</th>
<th>Time Management</th>
</tr>
</thead>
<tbody>
<tr>
<td>Demonstrating Responsibility</td>
<td>Teamwork Skills</td>
<td>Managing Time</td>
</tr>
<tr>
<td>Dealing with Information Overload</td>
<td>Reasons Companies Use Teams</td>
<td>Putting First Things First</td>
</tr>
<tr>
<td>Transferable Job Skills</td>
<td>Decisions Teams Make</td>
<td>Juggling Many Priorities</td>
</tr>
<tr>
<td>Managing Change</td>
<td>Team Responsibilities</td>
<td>Overcoming Procrastination</td>
</tr>
<tr>
<td>Adopting a New Technology</td>
<td>Problems That Affect Teams</td>
<td>Organizing Workspace and Tasks</td>
</tr>
<tr>
<td>Expressing Yourself on a Team</td>
<td></td>
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</tr>
<tr>
<td>Giving and Receiving Constructive Criticism</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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

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

**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-AST5-2
Identify and utilize personal safety procedures and proper use of tools in the automotive shop.

The tasks in the following standards originated from the NATEF-Required Supplemental Tasks.

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

Course Standard 3

TDL-AST5-3
Identify and utilize proper tools and equipment in the automotive shop.

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

Course Standard 4

TDL-AST5-4
Identify and utilize vehicle service information and prepare the vehicle for the customer.

4.1 Identify information needed and the service requested on a repair order.
4.2 Identify purpose and demonstrate proper use of fender covers, and mats.
4.3 Demonstrate use of the three C’s (concern, cause, and correction).
4.4 Review vehicle service history.
4.5 Complete work order to include customer information, vehicle identifying information, customer concern, related service history, cause, and correction.
4.6 Ensure vehicle is prepared to return to customer per school/company policy (floor mats, steering wheel cover, etc.).
Course Standard 5

TDL-AST5-5
Demonstrate general engine service techniques when repairing and diagnosing cylinder head and valve train issues.

Cylinder head and valve train diagnosis and repair
5.1 Remove cylinder head; inspect gasket condition; install cylinder head and gasket; tighten according to manufacturer’s specifications and procedures (P-1).
5.2 Clean and visually inspect a cylinder head for cracks; check gasket surface areas for warpage and surface finish; check passage condition (P-1).
5.3 Inspect pushrods, rocker arms, rocker arm pivots and shafts for wear, bending, cracks, looseness, and blocked oil passages (orifices); determine necessary action (P-2).
5.4 Inspect and replace camshaft and drive belt/chain; includes checking drive gear wear and backlash, end play, sprocket and chain wear, overhead cam drive sprocket(s), drive belt(s), belt tension, tensioners, camshaft reluctor ring/tone-wheel, and valve timing components; verify correct camshaft timing (P-1).

Course Standard 6

TDL-AST5-6
Perform general automatic transmission and manual transaxle and differential service.

Manual Drive Train and Axles

Clutch Diagnosis and Repair
6.1 Diagnose clutch noise, binding, slippage, pulsation, and chatter; determine necessary action (P-1).

Drive Axles
6.2 Remove and replace drive axle shafts (P-1).
6.3 Inspect and replace drive axle shaft seals, bearings, and retainers (P-2).
6.4 Measure drive axle flange runout and shaft end play; determine necessary action (P-2).

Course Standard 7

TDL-AST5-7
Prepare vehicle for general suspension and steering systems service.

Suspension and Steering

Steering systems diagnosis and repair
7.1 Remove and replace steering wheel; center/time supplemental restraint system (SRS) coil (clock spring) (P-1).
7.2 Diagnose steering column noises, looseness, and binding concerns (including tilt mechanisms); determine necessary action (P-2).
7.3 Diagnose power steering gear (non-rack and pinion) binding, uneven turning effort, looseness, hard steering, and noise concerns; determine necessary action (P-2).
7.4 Diagnose power steering gear (rack and pinion) binding, uneven turning effort, looseness, hard steering, and noise concerns; determine necessary action (P-2).
7.5 Inspect steering shaft universal-joint(s), flexible coupling(s), collapsible column, lock cylinder mechanism, and steering wheel; perform necessary action (P-2).
7.6 Remove and reinstall power steering pump (P-2).
7.7 Remove and reinstall press fit power steering pump pulley; check pulley and belt alignment (P-2).

Suspension systems diagnosis and repair
7.8 Inspect, remove and install strut rods and bushings (P-3).
7.9 Inspect, remove and install track bar, strut rods/radius arms, and related mounts and bushings (P-3).
7.10 Inspect rear suspension system leaf spring(s), bushings, center pins/bolts, and mounts (P-1).
Related suspension and steering service
7.11 Remove, inspect, and service or replace front and rear wheel bearings (P-1).

Course Standard 8

TDL-AST5-8
Perform hydraulic brake system service and repairs and diagnose and repair wheel bearings, parking brakes, and related electrical.

Brakes

Drum brake diagnosis and repair
8.1 Diagnose poor stopping, noise, vibration, pulling, grabbing, dragging or pedal pulsation concerns; determine necessary action (P-1).

Disc brake diagnosis and repair
8.2 Diagnose poor stopping, noise, vibration, pulling, grabbing, dragging, or pulsation concerns; determine necessary action (P-1).

Power-assist units diagnosis and repair
8.3 Inspect vacuum-type power booster unit for leaks; inspect the check-valve for proper operation; determine necessary action (P-1).
8.4 Inspect and test hydraulically-assisted power brake system for leaks and proper operation; determine necessary action (P-3).
8.5 Measure and adjust master cylinder pushrod length (P-3).

Miscellaneous (wheel bearings, parking brakes, electrical, etc.) diagnosis and repair
8.6 Diagnose wheel bearing noises, wheel shimmy, and vibration concerns; determine necessary action (P-3).
8.7 Remove and reinstall sealed wheel bearing assembly (P-2).

Electronic brake, traction and stability control systems diagnosis and repair
8.8 Identify and inspect electronic brake control system components; determine necessary action (P-1).

Course Standard 9

TDL-AST5-9
Perform general electrical systems service and diagnose and repair gauges, warning devices, and driver information systems.

Electrical/Electronic Systems

General: electrical system diagnosis
9.1 Diagnose the cause(s) of excessive key-off battery drain (parasitic draw); determine necessary action (P-1).

Lighting systems diagnosis and repair
9.2 Diagnose (troubleshoot) the causes of brighter-than-normal, intermittent, dim, or no light operation; determine necessary action (P-1).

Gauges, warning devices, and driver information systems diagnosis and repair
9.3 Inspect and test gauges and gauge sending units for causes of abnormal gauge readings; determine necessary action (P-2).

Course Standard 10

TDL-AST5-10
Demonstrate diagnosis and repair knowledge for A/C systems.

Heating and Air Conditioning

General: A/C system diagnosis and repair
10.1 Identify and interpret heating and air conditioning problems; determine necessary action (P-1).
10.2 Identify refrigerant type; select and connect proper gauge set; record temperature and
pressure readings (P-1).
10.3 Leak test A/C system; determine necessary action (P-1).

Refrigeration system component diagnosis and repair
10.4 Inspect, test, service or replace A/C compressor clutch components and/or assembly;
check compressor clutch air gap; adjust as needed (P-2).
10.5 Remove, inspect, and install expansion valve or orifice (expansion) tube (P-1).
10.6 Inspect evaporator housing water drain; perform necessary action (P-1).

Heating, ventilation, and engine cooling systems diagnosis and repair
10.7 Inspect and test heater control valve(s); perform necessary action (P-2).

Operating systems and related controls diagnosis and repair
10.8 Inspect and test A/C-heater blower motors, resistors, switches, relays, wiring, and
protection devices; perform necessary action (P-1).

Refrigerant recovery, recycling, and handling
10.9 Identify and recover A/C system refrigerant (P-1).

### Course Standard 11

**TDL-ASE5-11**

Analyze engine performance by using computerized engine and emissions control systems.

**Engine Performance**

Computerized engine controls diagnosis and repair

11.1 Access and use service information to perform step-by-step (troubleshooting)
diagnosis (P-1).
11.2 Perform active tests of actuators using a scan tool; determine necessary action (P-2).

Emissions control systems diagnosis and repair

11.3 Diagnose oil leaks, emissions, and drivability concerns caused by the positive
 crankcase ventilation (PCV) system; determine necessary action (P-3).
11.4 Inspect and test electrical/electronically-operated components and circuits of air
 injection systems; perform necessary action (P-3).
11.5 Inspect and test components and hoses of the evaporative emissions control system;
perform necessary action (P-1).
11.6 Interpret diagnostic trouble codes (DTCs) and scan tool data related to the emissions
control systems; determine necessary action (P-3).