

Transportation, Distribution and Logistics Career Cluster
General Automotive Technology Pathway
Automotive Technologies 3
Course Number 47.45200

Course Description: This course is designed as the third course for the General Automotive Technology Pathway. Students in this course will learn the basic skills needed to gain employment as an entry level automotive technician. Students will be exposed to courses in automotive preventative maintenance, brakes, steering and suspension, electrical systems, engine repair, engine performance, automatic transmission, manual transmission and differential & automotive HVAC. The hours completed in this course are aligned with ASE standards and are a base for the entry-level technician. The prerequisite for this course is advisor approval and successful completion of Automotive Technologies 2.

All the tasks are assigned a priority number: P-1, P-2, or P-3 (refer to ASE Education Foundation task list <https://www.aseeducation.org/resources>). The standards recognize that program content requirements vary by program type and regional employment needs. Therefore, flexibility has been built into the task list by assigning each task a priority number. The priority number simply indicates the minimum percentage of tasks that a program must include in their curriculum.

- Ninety-five percent (95%) of Priority 1 (P-1) tasks must be taught.
- Eighty percent (80%) of Priority 2 (P-2) tasks must be taught.
- Fifty percent (50%) of the Priority 3 (P-3) tasks must be taught.

Note: A task is a psychomotor or cognitive entry-level learning activity consisting of one or more measurable steps accomplished through an instructor presentation, demonstration, visualization or a student application.

Theory instruction and hands-on performance of all the basic tasks will provide initial training for entry-level employment in the automotive service field or prepare the student for further training. Competency in the tasks will indicate to employers that the graduate has the skills needed for entry-level employment in the automotive service field.

1. It is assumed that:

- at all levels, appropriate theory, safety, and support instruction will be required for performing each task;
- the instruction has included identification and use of appropriate tools and testing and measurement equipment required to accomplish certain tasks;
- the student has received the necessary training to locate and use current reference and training materials from accepted industry publications and resources;
- at all levels, the student has demonstrated the ability to write work orders and warranty reports, to include information regarding problem resolution and the results of the work performed for the customer and manufacturer. The writing process will incorporate the “Three C’s” (concern, cause and correction) as a format to communicate this information.
- at all levels, students will become familiar with and use service information and reference materials to develop a problem-solving process/procedure

Georgia Department of Education

2. It is assumed that:
 - all diagnostic and repair tasks described in this document are to be accomplished in accordance with manufacturer's recommended procedures and safety precautions as published.
3. It is assumed that:
 - Individual courses of study will differ across automobile training programs and any redundancies in the technical standards are built in to ensure that appropriate review and individual task mastery can be achieved at different levels of the program. They are also built in to allow instruction at different levels of understanding as regional and local industry needs may dictate. Additionally, these standards are a framework from which curriculum, lessons, and units of instruction are built from.
 - development of appropriate learning delivery systems and tests which monitor student progress will be the responsibility of the individual training program.
 - the learning progress of students will be monitored and evaluated against these performance standards;
 - a system is in place that informs all students of their individual progress through all phases of the training program.
4. It is assumed that:
 - all students will receive instruction in the storage, handling, and use of Hazardous Materials as required in Hazard Communication Title 29, Code of Federal Regulation Part 1910.1200, "Right to Know Law", and state and local requirements.
 - hazardous and toxic materials will be handled, removed and recycled or disposed of according to federal, state, and local regulations.
5. It is assumed that:
 - All required supplemental tasks are being taught and reinforced continually throughout the pathway, they are not intended to be taught as stand-alone concepts or units.

REQUIRED SUPPLEMENTAL TASKS

Shop and Personal Safety

1. Identify general shop safety rules and procedures.
2. Utilize safe procedures for handling of tools and equipment.
3. Identify and use proper placement of floor jacks and jack stands.
4. Identify and use proper procedures for safe lift operation.
5. Utilize proper ventilation procedures for working within the lab/shop area.
6. Identify marked safety areas.
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.
8. Identify the location and use of eye wash stations.
9. Identify the location of the posted evacuation routes.
10. Comply with the required use of safety glasses, ear protection, gloves, and shoes during lab/shop activities.
11. Identify and wear appropriate clothing for lab/shop activities.
12. Secure hair and jewelry for lab/shop activities.
13. Demonstrate awareness of the safety aspects of supplemental restraint systems (SRS), electronic brake control systems, and hybrid vehicle high voltage circuits.
14. Demonstrate awareness of the safety aspects of high voltage circuits (such as high intensity discharge (HID) lamps, ignition systems, injection systems, etc.).
15. Locate and demonstrate knowledge of material safety data sheets (MSDS).

Georgia Department of Education

16. Complete work order to include customer information, vehicle identifying information, customer concern, related service history, cause, and correction.

Tools and Equipment

1. Identify tools and their usage in automotive applications.
2. Identify standard and metric designation.
3. Demonstrate safe handling and use of appropriate tools.
4. Demonstrate proper cleaning, storage, and maintenance of tools and equipment.
5. Demonstrate proper use of precision measuring tools (i.e. micrometer, dial-indicator, dial-caliper).

Preparing Vehicle for Service

1. Identify information needed and the service requested on a repair order.
2. Identify purpose and demonstrate proper use of fender covers, mats.
3. Demonstrate use of the three C's (concern, cause, and correction).
4. Review vehicle service history.

Preparing Vehicle for Customer

1. Ensure vehicle is prepared to return to customer per school/company policy (floor mats, steering wheel cover, vehicle cleanliness, radio presets, etc.).

GENERAL COURSE STANDARDS

The following are the General Course Standards, to be integrated throughout the three pathway courses, they are not intended to be taught as stand-alone concepts or units.

Course Standard 1

TDL-AT3-GS1

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

Georgia Department of Education

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
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
------------------	--------------------------	-----------------------	--------------------	-----------------------

Georgia Department of Education

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
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			

Georgia Department of Education

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. Additional Georgia Standards of Excellence ELA/Literacy standards for Speaking and Listening are listed in the foundational course standards below.

Course Standard 2

TDL-AT3-GS2

Identify and utilize safety procedures and proper tools.

- 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).

Support of CTAE Foundation Course Standards and Georgia Standards of Excellence

ELACC9-10SL1: Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 9–10 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively.

Course Standard 3

TDL-AT3-GS3

Research and utilize proper tools and equipment.

- 3.1 Identify tools and their usage in automotive applications.
- 3.2 Identify standard and metric designations.
- 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 (e.g. micrometer, dial-indicator, and dial-caliper).

Support of CTAE Foundation Course Standards and Georgia Standards of Excellence

ELACC9-10SL1: Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 9–10 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively.

Georgia Department of Education

ELACC9-10SL4: Present information, findings, and supporting evidence clearly, concisely, and logically such that listeners can follow the line of reasoning and the organization, development, substance, and style are appropriate to purpose, audience, and task.

Course Standard 4

TDL-AT3-GS4

Research and utilize vehicle service information.

- 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.).
- 4.7 Identify and use applicable service information materials to include service manuals, manufacturer service information, and bulletins to develop a process/procedure for diagnostics

Support of CTAE Foundation Course Standards and Georgia Standards of Excellence

ELACC9-10SL1: Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 9–10 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively.

Course Standard 5

TDL-AT3-GS5

Develop an understanding of automotive careers, describing the principal fields of specializations and identifying associated career opportunities.

- 5.1 Identify education requirements for automotive occupations and locations where programs of study are available.
- 5.2 Match automotive job titles with qualifications and responsibilities.
- 5.3 Participate in activities related to career interests.

Support of CTAE Foundation Course Standards and Georgia Standards of Excellence

ELACC9-10SL1: Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 9–10 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively.

ELACC9-10SL4: Present information, findings, and supporting evidence clearly, concisely, and logically such that listeners can follow the line of reasoning and the organization, development, substance, and style are appropriate to purpose, audience, and task.

Course Standard 6

TDL-AT3-GS6

Examine how related student organizations are integral parts of career and technology education courses through leadership development, school and community service projects, and competitive events.

- 6.1 Explain the purpose, mission, objectives, motto, colors, official dress and other distinguishing characteristics of SkillsUSA.
- 6.2 Explain how participation in SkillsUSA can promote lifelong responsibility for community service, professional growth and development.

Georgia Department of Education

- 6.3 Explore the impact and opportunities SkillsUSA can develop to bring business and industry together with education in a positive working relationship through innovative leadership and career development programs.
- 6.4 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.

Support of CTAE Foundation Course Standards and Georgia Standards of Excellence

ELACC9-10SL1: Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 9–10 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively.

ELACC9-10SL4: Present information, findings, and supporting evidence clearly, concisely, and logically such that listeners can follow the line of reasoning and the organization, development, substance, and style are appropriate to purpose, audience, and task.

Georgia Department of Education
TECHNICAL STANDARDS

TDL-AT3-TS1

Technical Standard 1

Perform general engine service.
(ASE: A1 Engine Repair)

For every task in Engine Repair, the following safety requirement must be strictly enforced: Comply with personal and environmental safety practices associated with clothing; eye protection; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of chemicals/materials in accordance with local, state, and federal safety and environmental regulations.

I. ENGINE REPAIR

A. General:

1. Complete work order to include customer information, vehicle identifying information, customer concern, related service history, cause, and correction. P-1
2. Research applicable vehicle and service information, including fluid type, internal engine operation, vehicle service history, service precautions, and technical service bulletins. P-1
3. Verify operation of the instrument panel engine warning indicators. P-1
4. Inspect engine assembly for fuel, oil, coolant, and other leaks; determine needed action. P-1
5. Install engine covers using gaskets, seals, and sealers as required. P-1
6. Verify engine mechanical timing. P-1
7. Perform common fastener and thread repair, to include: remove broken bolt, restore internal and external threads, and repair internal threads with thread insert. P-1
8. Inspect, remove, and/or replace engine mounts. P-2
9. Identify service precautions related to service of the internal combustion engine of a hybrid vehicle. P-2

B. Cylinder Head and Valve Train

1. Adjust valves (mechanical or hydraulic lifters). P-3
2. Identify components of the cylinder head and valve train. P-1
3. Establish camshaft position sensor indexing. P-1

C. Lubrication and Cooling Systems

1. Perform cooling system pressure and dye tests to identify leaks; check coolant condition and level; inspect and test radiator, pressure cap, coolant recovery tank, heater core, and galley plugs; determine necessary action. P-1
2. Identify causes of engine overheating. P-1

Georgia Department of Education

3. Inspect, replace, and/or adjust drive belts, tensioners, and pulleys; check pulley and belt alignment. P-1
4. Remove, inspect, and replace thermostat and gasket/seal. P-1
5. Inspect and test fan(s), fan clutch (electrical or mechanical), fan shroud, and air dams; determine needed action. P-1
6. Inspect and test coolant; drain and recover coolant; flush and refill cooling system; use proper fluid type per manufacturer specification; bleed air as required. P-1

Support of CTAE Foundation Course Standards and Georgia Standards of Excellence

ELACC9-10SL4: Present information, findings, and supporting evidence clearly, concisely, and logically such that listeners can follow the line of reasoning and the organization, development, substance, and style are appropriate to purpose, audience, and task.

TDL-AT3-TS2

Technical Standard 2

Perform general automatic transmission service.

(ASE: A2 Automatic Transmission/Transaxle Service and Repair)

For every task in Automatic Transmission/Transaxle Service and Repair, the following safety requirement must be strictly enforced: Comply with personal and environmental safety practices associated with clothing; eye protection; hand tools; power equipment; proper ventilation; and the

handling, storage, and disposal of chemicals/materials in accordance with local, state, and federal safety and environmental regulations.

II. AUTOMATIC TRANSMISSION AND TRANSAXLE

A. General

1. Research vehicle service information including fluid type, vehicle service history, service precautions, and technical service bulletins. P-1
2. Check fluid level in a transmission or a transaxle equipped with a dip-stick. P-1
3. Check fluid level in a transmission or a transaxle not equipped with a dip-stick. P-1
4. Check transmission fluid condition; check for leaks. P-2
5. Identify drive train components and configuration. P-1
6. Identify fluid loss and condition concerns; determine needed action. P-1

B. In-Vehicle Transmission/Transaxle

1. Inspect, adjust, and/or replace external manual valve shift linkage, transmission range sensor/switch, and/or park/neutral position switch. P-2
2. Drain and replace fluid and filter(s); use proper fluid type per manufacturer specification. P-1

C. Off-Vehicle Transmission and Transaxle

1. Describe the operational characteristics of a continuously variable transmission (CVT). P-3
2. Describe the operational characteristics of a hybrid vehicle drive train. P-3

Support of CTAE Foundation Course Standards and Georgia Standards of Excellence

ELACC9-10SL2: Integrate multiple sources of information presented in diverse media or formats (e.g., visually, quantitatively, orally) evaluating the credibility and accuracy of each source.

TDL-AT3-TS3

Technical Standard 3

Perform general manual transmission/transaxle/axle service.

(ASE: A3 Manual Drivetrain and Axle Service and Repair)

For every task in Manual Drivetrain and Axle Service and Repair, the following safety requirement must be strictly enforced: Comply with personal and environmental safety practices associated with

clothing; eye protection; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of chemicals/materials in accordance with local, state, and federal safety and environmental regulations.

III. MANUAL DRIVETRAIN AND AXLES

A. General

1. Research vehicle service information including fluid type, vehicle service history, service precautions, and technical service bulletins. P-1
2. Check fluid condition; check for leaks. P-2
3. Identify manual drivetrain and axle components and configuration. P-1
4. Drain and refill manual transmission/transaxle and final drive unit; use proper fluid type per manufacturer specification. P-1

B. Clutch

1. Check and adjust clutch master cylinder fluid level; use proper fluid type per manufacturer specification P-1

C. Transmission/Transaxle

1. Inspect locking hubs. P-3
2. Check for leaks at drive assembly and transfer case seals; check vents; check fluid level; use proper fluid type per manufacturer specification. P-2
5. Describe the operational characteristics of an electronically-controlled manual transmission/transaxle. P-2

D. Drive Shaft, Half Shafts, Universal Joints and Constant-Velocity (CV) Joints (Front, Rear, All, and Four-wheel drive)

1. Inspect, remove, and/or replace bearings, hubs, and seals. P-2
2. Inspect, service, and/or replace shafts, yokes, boots, and universal/CV joints. P-2
3. Inspect locking hubs. P-3
4. Check for leaks at drive assembly and transfer case seals; check vents; check fluid level; use proper fluid type per manufacturer specification. P-2

Georgia Department of Education

5. Diagnose constant-velocity (CV) joint noise and vibration concerns; determine needed action. P-1
6. Diagnose universal joint noise and vibration concerns; determine needed action. P-2
7. Check shaft balance and phasing; measure shaft runout; measure and adjust driveline angles. P-2

E. Differential Case Assembly

E.1 Ring and Pinion Gears and Differential Case Assembly

1. Clean and inspect differential case; check for leaks; inspect housing vent. P-1
2. Check and adjust differential case fluid level; use proper fluid type per manufacturer specification. P-1
3. Drain and refill differential case; using proper fluid type per manufacturer specification, P-1
4. Inspect and replace companion flange and/or pinion seal; measure companion flange runout. P-2

E.2 Drive Axles

1. Inspect and replace drive axle wheel studs. P-1
2. Remove and replace drive axle shafts. P-1
3. Inspect and replace drive axle shaft seals, bearings, and retainers. P-2
4. Measure drive axle flange runout and shaft end play; determine needed action. P-2

III. MANUAL DRIVE TRAIN AND AXLES

F. Four-wheel Drive/All-wheel Drive Component Diagnosis and Repair

1. Inspect, adjust, and repair shifting controls (mechanical, electrical, and vacuum), bushings, mounts, levers, and brackets. P-3
2. Inspect locking hubs; determine needed action(s). P-3
3. Check for leaks at drive assembly and transfer case seals; check vents; check fluid level; use proper fluid type per manufacturer specification. P-3
4. Identify concerns related to variations in tire circumference and/or final drive ratios. P-2

Support of CTAE Foundation Course Standards and Georgia Standards of Excellence

ELACC9-10SL1: Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 9–10 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively.

ELACC9-10SL4: Present information, findings, and supporting evidence clearly, concisely, and logically such that listeners can follow the line of reasoning and the organization, development, substance, and style are appropriate to purpose, audience, and task.

Technical Standard 4

Perform general suspension and steering systems service.

(ASE: A4 Suspension and Steering)

For every task in Suspension and Steering, the following safety requirement must be strictly enforced: Comply with personal and environmental safety practices associated with clothing; eye protection; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of chemicals/materials in accordance with local, state, and federal safety and environmental regulations.

IV. SUSPENSION AND STEERING SYSTEMS

A. General

1. Research vehicle service information including fluid type, vehicle service history, service precautions, and technical service bulletins. P-1
2. Identify suspension and steering system components and configurations. P-1
3. Identify and interpret suspension and steering system concerns; determine needed action. P-2
4. Disable and enable supplemental restraint system (SRS); verify indicator lamp operation. P-1

B. Suspension and Steering Service

1. Inspect rack and pinion steering gear inner tie rod ends (sockets) and bellows boots, replace as needed. P-1
2. Inspect power steering fluid level and condition. P-1
3. Inspect for power steering fluid leakage, determine needed action. P-1
4. Inspect tie rod ends (sockets), tie rod sleeves, and clamps. P-1
5. Inspect upper and lower control arms, bushings, and shafts. P-1
6. Inspect steering shaft universal-joint(s), flexible coupling(s), collapsible column, lock cylinder mechanism, and steering wheel; determine needed action. P-2
7. Flush, fill, and bleed power steering system; use proper fluid type per manufacturer specification. P-2
8. Remove, inspect, replace, and/or adjust power steering pump drive belt. P-1
9. Inspect and replace power steering hoses and fittings. P-2
10. Inspect and replace rebound bumpers. P-1
11. Inspect track bar, strut rods/radius arms, and related mounts and bushings. P-1

Georgia Department of Education

12. Inspect suspension system coil springs and spring insulators (silencers). P-1
13. Inspect suspension system torsion bars and mounts. P-1
14. Inspect and/or replace front/rear stabilizer bar (sway bar) bushings, brackets, and links. P-1
15. Inspect front strut bearing and mount. P-1
16. Inspect rear suspension system lateral links/arms (track bars), control (trailing) arms. P-1
17. Inspect rear suspension system leaf spring(s), spring insulators (silencers), shackles, brackets, bushings, center pins/bolts, and mounts. P-1
18. Inspect, remove, and/or replace shock absorbers; inspect mounts and bushings. P-1
20. Remove, inspect, service, and/or replace front and rear wheel bearings. P-1
21. Inspect, remove, and/or replace strut cartridge or assembly; inspect mounts and bushings. P-1
22. Inspect electric power steering assist system. P-2
23. Identify hybrid vehicle power steering system electrical circuits and safety precautions. P-2
24. Describe the function of suspension and steering control systems and components, (i.e. active suspension, and stability control). P-3

C. Suspension Systems Diagnosis and Repair

1. Inspect rear suspension system leaf spring(s), spring insulators (silencers), shackles, brackets, bushings, center pins/bolts, and mounts P-1
2. Remove and reinstall power steering pump. P-2
3. Remove and reinstall press fit power steering pump pulley; check pulley and belt alignment. P-2
4. Inspect, remove, and/or replace pitman arm, relay (centerlink/intermediate) rod, idler arm, mountings, and steering linkage damper. P-2
5. Inspect, replace, and/or adjust tie rod ends (sockets), tie rod sleeves, and clamps. P-1
6. Identify hybrid vehicle power steering system electrical circuits and safety precautions. P-1
7. Inspect electric power steering assist system. P-2

P-2

D. Wheels and Tires

- 1. Inspect tire condition; identify tire wear patterns; check for correct tire size, application (load and speed ratings), and air pressure as listed on the tire information placard/label. P-1
- 2. Diagnose wheel/tire vibration, shimmy, and noise; determine needed action P-2
- 3. Rotate tires according to manufacturer’s recommendations including vehicles equipped with tire pressure monitoring systems (TPMS). P-1
- 4. Dismount, inspect, and remount tire on wheel; balance wheel and tire assembly. P-1
- 5. Inspect tire and wheel assembly for air loss; determine necessary action. P-1
- 6. Dismount, inspect, and remount tire on wheel; balance wheel and tire assembly. P-1
- 7. Dismount, inspect, and remount tire on wheel equipped with tire pressure monitoring system sensor. P-1
- 8. Identify indirect and direct tire pressure monitoring systems (TPMS); calibrate system; verify operation of instrument panel lamps. P-1
- 9. Demonstrate knowledge of steps required to remove and replace sensors in a tire pressure monitoring system (TPMS) including relearn procedure. P-1

E. Wheel Alignment, Diagnosis, Adjustment, and Repair

- 1. Diagnose vehicle wander, drift, pull, hard steering, bump steer, memory steer, torque steer, and steering return concerns; determine needed action. P-1
- 2. Perform pre-alignment inspection; measure vehicle ride height; determine needed action. P-1
- 3. Prepare vehicle for wheel alignment on alignment machine; perform four-wheel alignment by checking and adjusting front and rear wheel caster, camber; and toe as required; center steering wheel. P-1
- 4. Check toe-out-on-turns (turning radius); determine needed action. P-2
- 5. Check steering axis inclination (SAI) and included angle; determine needed action. P-2
- 6. Check rear wheel thrust angle; determine needed action. P-1
- 7. Check for front wheel setback; determine needed action. P-2
- 8. Check front and/or rear cradle (subframe) alignment; determine needed action. P-3
- 9. Reset steering angle sensor P-2

Support of CTAE Foundation Course Standards and Georgia Standards of Excellence

ELACC9-10SL1: Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 9–10 topics, texts, and issues, building on others’ ideas and expressing their own clearly and persuasively.

ELACC9-10SL4: Present information, findings, and supporting evidence clearly, concisely, and logically such that listeners can follow the line of reasoning and the organization, development, substance, and style are appropriate to purpose, audience, and task.

TDL-AT3-TS5

Technical Standard 5

Brake System Service

Georgia Department of Education
(ASE: A5 Brakes System Service and Repair)

For every task in Brakes, the following safety requirement must be strictly enforced: Comply with personal and environmental safety practices associated with clothing; eye protection; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of chemicals/materials in accordance with local, state, and federal safety and environmental regulations.

V. BRAKES

A. General: Brake Systems Diagnosis

- | | |
|--|-----|
| 1. Identify and interpret brake system concerns; determine needed action. | P-1 |
| 2. Research vehicle service information including fluid type, vehicle service history, service precautions, and technical service bulletins. | P-1 |
| 3. Describe procedure for performing a road test to check brake system operation including an anti-lock brake system (ABS). | P-1 |
| 4. Install wheel and torque lug nuts. | P-1 |

V. BRAKES

B. Hydraulic System Diagnosis and Repair

- | | |
|--|-----|
| 1. Diagnose pressure concerns in the brake system using hydraulic principles (Pascal's Law). | P-1 |
| 2. Measure brake pedal height, travel, and free play (as applicable); determine needed action. | P-1 |
| 3. Check master cylinder for internal/external leaks and proper operation; determine needed action. | P-1 |
| 4. Remove, bench bleed, and reinstall master cylinder. | P-1 |
| 5. Diagnose poor stopping, pulling or dragging concerns caused by malfunctions in the hydraulic system; determine needed action. | P-3 |
| 6. Inspect brake lines, flexible hoses, and fittings for leaks, dents, kinks, rust, cracks, bulging, wear, and loose fittings/supports; determine needed action. | P-1 |
| 7. Replace brake lines, hoses, fittings, and supports. | P-2 |
| 8. Fabricate brake lines using proper material and flaring procedures (double flare and ISO types). | P-2 |
| 9. Select, handle, store, and fill brake fluids to proper level; use proper fluid type per manufacturer specification. | P-1 |
| 10. Inspect, test, and/or replace components of brake warning light system. | P-3 |
| 11. Identify components of hydraulic brake warning light system. | P-2 |
| 12. Bleed and/or flush brake system. | P-1 |

13. Test brake fluid for contamination.

P-1

V. BRAKES

C. Drum Brake Diagnosis and Repair

- 1. Diagnose poor stopping, noise, vibration, pulling, grabbing, dragging or pedal pulsation concerns; determine needed action. P-1
- 2. Remove, clean, and inspect brake drum; measure brake drum diameter; determine serviceability. P-1
- 3. Refinish brake drum and measure final drum diameter; compare with specification. P-1
- 4. Remove, clean, inspect, and/or replace brake shoes, springs, pins, clips, levers, adjusters/self-adjusters, other related brake hardware, and backing support plates; lubricate and reassemble. P-1
- 5. Inspect wheel cylinders for leaks and proper operation; remove and replace as needed. P-2
- 6. Pre-adjust brake shoes and parking brake; install brake drums or drum/hub assemblies and wheel bearings; perform final checks and adjustments. P-1

V. BRAKES

D. Disc Brake Diagnosis and Repair

- 1. Diagnose poor stopping, noise, vibration, pulling, grabbing, dragging, or pulsation concerns; determine needed action. P-1
- 2. Remove and clean caliper assembly; inspect for leaks, damage, and wear; determine needed action. P-1
- 3. Inspect caliper mounting and slides/pins for proper operation, wear, and damage; determine needed action. P-1
- 4. Remove, inspect, and/or replace brake pads and retaining hardware; determine needed action. P-1
- 5. Lubricate and reinstall caliper, brake pads, and related hardware; seat brake pads; inspect for leaks. P-1
- 6. Clean and inspect rotor and mounting surface; measure rotor thickness, thickness variation, and lateral runout; determine needed action. P-1
- 7. Remove and reinstall/replace rotor. P-1
- 8. Refinish rotor on vehicle; measure final rotor thickness and compare with specification. P-1
- 9. Refinish rotor off vehicle; measure final rotor thickness and compare with specification. P-1
- 10. Retract and re-adjust caliper piston on an integrated parking brake system. P-2
- 11. Check brake pad wear indicator; determine needed action. P-1
- 12. Describe importance of operating vehicle to burnish/break-in replacement brake pads according to manufacturer's recommendations. P-1

V. BRAKES

E. Power-Assist Units Diagnosis and Repair

- 1. Check brake pedal travel with and without engine running to verify proper power booster operation. P-2
- 2. Identify components of the brake power assist system (vacuum and hydraulic); check vacuum supply (manifold or auxiliary pump) to vacuum-type power booster. P-1
- 3. Inspect vacuum-type power booster unit for leaks; inspect the check-valve for proper operation; determine needed action. P-1

Georgia Department of Education

4. Inspect and test hydraulically-assisted power brake system for leaks and proper operation; determine needed action. P-3
5. Measure and adjust master cylinder pushrod length. P-3

V. BRAKES

F. Related Systems (i.e. Wheel Bearings, Parking Brakes, Electrical) Diagnosis and Repair

1. Diagnose wheel bearing noises, wheel shimmy, and vibration concerns; determine needed action. P-2
2. Remove, clean, inspect, repack, and install wheel bearings; replace seals; install hub and adjust bearings. P-2
3. Check parking brake system components for wear, binding, and corrosion; clean, lubricate, adjust and/or replace as needed. P-1
4. Check parking brake operation and parking brake indicator light system operation; determine needed action. P-1
5. Check operation of brake stop light system. P-1
6. Replace wheel bearing and race. P-3
7. Inspect and replace wheel studs. P-1
8. Remove, reinstall, and/or replace sealed wheel bearing assembly. P-1

V. BRAKES

G. Electronic Brake Control Systems: Antilock Brake (ABS), Traction Control (TCS) and Electronic Stability Control (ESC) Systems Diagnosis and Repair

1. Identify and inspect electronic brake control system components (ABS, TCS, ESC); determine needed action. P-1
2. Describe the operation of a regenerative braking system. P-3

Support of CTAE Foundation Course Standards and Georgia Standards of Excellence

ELACC9-10SL1: Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 9–10 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively.

TDL-AT3-TS6

Technical Standard 6

Electrical System Service

(ASE: A6 Electrical/Electronic Systems Service and Repair)

For every task in Electrical/Electronic Systems, the following safety requirement must be strictly enforced: Comply with personal and environmental safety practices associated with clothing; eye protection; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of chemicals/materials in accordance with local, state, and federal safety and environmental regulations.

VI. ELECTRICAL/ELECTRONIC SYSTEMS

A. General

1. Research vehicle service information including vehicle service history, service precautions, and technical service bulletins. P-1
2. Demonstrate knowledge of electrical/electronic series, parallel, and series-parallel circuits using principles of electricity (Ohm's Law). P-1
3. Use wiring diagrams to trace/diagnose electrical/electronic circuits. P-1
4. Demonstrate proper use of a digital multimeter (DMM) when measuring source voltage, voltage drop (including grounds), current flow, and resistance. P-1
5. Use a test light to check operation of electrical circuits. P-2
6. Inspect and test fusible links, circuit breakers, and fuses; determine necessary action. P-1
7. Repair and/or replace connectors, terminal ends, and wiring of electrical/electronic systems (including solder repair) P-1

Georgia Department of Education

8. Identify electrical/electronic system components and configuration. P-1
9. Use fused jumper wires to check operation of electrical circuits P-1
10. Inspect, test, repair, and/or replace components, connectors, terminals, harnesses, and wiring in electrical/electronic systems (including solder repairs); determine needed action. P-1
11. Demonstrate knowledge of the causes and effects from shorts, grounds, opens, and resistance problems in electrical/electronic circuits. P-1
12. Measure key-off battery drain (parasitic draw). P-1

B. Battery Service

1. Maintain or restore electronic memory functions. P-1
2. Inspect and clean battery; fill battery cells; check battery cables, connectors, clamps, and hold-downs. P-1
3. Perform slow/fast battery charge according to manufacturer's recommendations. P-1
4. Jump-start vehicle using jumper cables and a booster battery or an auxiliary power supply. P-1
5. Identify electrical/electronic modules, security systems, radios, and other accessories that require reinitialization or code entry after reconnecting vehicle battery. P-1
6. Perform battery state-of-charge test; determine necessary action. P-1

Georgia Department of Education

7. Confirm proper battery capacity for vehicle application; perform battery capacity and load test; determine necessary action. P-1
8. Identify safety precautions for high voltage systems on electric, hybrid-electric, and diesel vehicles. P-2
9. Identify electrical/electronic modules, security systems, radios, and other accessories that require reinitialization or code entry after reconnecting vehicle battery. P-1
10. Identify hybrid vehicle auxiliary (12v) battery service, repair, and test procedures. P-2

C. Starting System

1. Perform starter current draw test; determine necessary action. P-1
2. Perform starter circuit voltage drop tests; determine necessary action. P-1
3. Inspect and test starter relays and solenoids; determine necessary action. P-2
4. Remove and install starter in a vehicle. P-1
5. Inspect and test switches, connectors, and wires of starter control circuits; determine necessary action. P-2
6. Demonstrate knowledge of an automatic idle-stop/start-stop system. P-2
7. Differentiate between electrical and engine mechanical problems that cause a slow-crank or a no-crank condition. P-2

D. Charging System

1. Inspect, adjust, and/or replace generator (alternator) drive belts; check pulleys and tensioners for wear; check pulley and belt alignment. P-1
2. Perform charging circuit voltage drop tests; determine necessary action. P-2
3. Perform charging system output test; determine necessary action. P-1
4. Diagnose (troubleshoot) charging system for causes of undercharge, no-charge, or overcharge conditions. P-1
5. Remove, inspect, and/or replace generator (alternator). P-1

E. Lighting, Instrument Cluster, Driver Information, and Body Electrical Systems

1. Inspect interior and exterior lamps and sockets including headlights and auxiliary lights (fog lights/driving lights); replace as needed. P-1

Georgia Department of Education

2. Describe the operation of keyless entry/remote-start systems. P-3
3. Verify operation of instrument panel gauges and warning/indicator lights; reset maintenance indicators. P-1
4. Verify windshield wiper and washer operation; replace wiper blades. P-1
5. Aim headlights. P-1
6. Identify system voltage and safety precautions associated with high-intensity discharge headlights. P-1

G. Body Electrical Systems Diagnosis and Repair

1. Describe operation of safety systems and related circuits (such as: horn, airbags, seat belt pretensioners, occupancy classification, wipers, washers, speed control/collision avoidance, heads-up display, parking assist, and back-up camera); determine needed repairs. P-3

Support of CTAE Foundation Course Standards and Georgia Standards of Excellence

ELACC9-10SL4: Present information, findings, and supporting evidence clearly, concisely, and logically such that listeners can follow the line of reasoning and the organization, development, substance, and style are appropriate to purpose, audience, and task.

TDL-AT3-TS7

Technical Standard 7

Heating, Ventilation and Air Conditioning Service (Automotive HVAC)

(ASE: A7 Heating and Air Conditioning System Service and Repair)

For every task in Heating, Ventilation and Air Conditioning (HVAC), the following safety requirement must be strictly enforced: Comply with personal and environmental safety practices associated with clothing; eye protection; hand tools; power equipment; proper ventilation; and the handling, storage,

Georgia Department of Education

and disposal of chemicals/materials in accordance with local, state, and federal safety and environmental regulations.

VII. HEATING, VENTILATION, AND AIR CONDITIONING (HVAC)

A. General: A/C System Diagnosis and Repair

- 1. Identify and interpret heating and air conditioning problems; determine needed action. P-1
- 2. Research vehicle service information including refrigerant/oil type, vehicle service history, service precautions, and technical service bulletins. P-1
- 3. Performance test A/C system; identify problems. P-1
- 4. Identify abnormal operating noises in the A/C system; determine needed action. P-2
- 5. Identify refrigerant type; select and connect proper gauge set/test equipment; record temperature and pressure readings. P-1
- 6. Leak test A/C system; determine needed action. P-1
- 7. Inspect condition of refrigerant oil removed from A/C system; determine needed action. P-2
- 8. Determine recommended oil and oil capacity for system application. P-1
- 9. Using a scan tool, observe and record related HVAC data and trouble codes. P-3

VII. HEATING, VENTILATION, AND AIR CONDITIONING (HVAC)

B. Refrigeration System Component Diagnosis and Repair

- 1. Inspect, remove, and/or replace A/C compressor drive belts, pulleys, and tensioners; visually inspect A/C components for signs of leaks; determine needed action. P-1
- 2. Inspect, test, service, and/or replace A/C compressor clutch components and/or assembly; check compressor clutch air gap; adjust as needed. P-2
- 3. Remove, inspect, and reinstall A/C compressor and mountings; determine recommended oil type and quantity. P-2
- 4. Identify hybrid vehicle A/C system electrical circuits and service/safety precautions. P-2
- 5. Determine need for an additional A/C system filter; determine needed action. P-3
- 6. Remove and inspect A/C system mufflers, hoses, lines, fittings, O-rings, seals, and service valves; determine needed action. P-2
- 7. Inspect for proper A/C condenser airflow; determine needed action. P-1
- 8. Remove, inspect, and reinstall receiver/drier or accumulator/drier; determine recommended oil type and quantity. P-2
- 9. Remove, inspect, and install expansion valve or orifice (expansion) tube. P-1
- 10. Inspect evaporator housing water drain; determine needed action. P-1
- 11. Determine procedure to remove and reinstall evaporator; determine required oil type and quantity. P-2

VII. HEATING, VENTILATION, AND AIR CONDITIONING (HVAC)

C. Heating, Ventilation, and Engine Cooling Systems Diagnosis and Repair

- 1. Inspect engine cooling and heater systems hoses and pipes; determine needed action. P-1
- 2. Inspect and test heater control valve(s); determine needed action. P-2
- 3. Determine procedure to remove, inspect, reinstall, and/or replace heater core. P-2

VII. HEATING, VENTILATION, AND AIR CONDITIONING (HVAC)

D. Operating Systems and Related Controls Diagnosis and Repair

Georgia Department of Education

1. Inspect and test HVAC system blower motors, resistors, switches, relays, wiring, and protection devices; determine needed action. P-1
2. Identify the source of HVAC system odors. P-2

VII. HEATING, VENTILATION, AND AIR CONDITIONING (HVAC)

E. Refrigerant Recovery, Recycling, and Handling

1. Perform correct use and maintenance of refrigerant handling equipment according to equipment manufacturer's standards. P-1
2. Identify A/C system refrigerant; test for sealants; recover, evacuate, and charge A/C system; add refrigerant oil as required. P-1
3. Recycle, label, and store refrigerant. P-1

Support of CTAE Foundation Course Standards and Georgia Standards of Excellence

ELACC9-10SL1: Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 9–10 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively.

TDL-AT3-TS8

Technical Standard 8

Engine Performance Service

(ASE: A8 Engine Performance Service and Repair)

For every task in Engine Performance the following safety requirement must be strictly enforced: Comply with personal and environmental safety practices associated with clothing; eye protection; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of chemicals/materials in accordance with local, state, and federal safety and environmental regulations.

VIII. ENGINE PERFORMANCE

A. General: Engine Diagnosis

1. Identify and interpret engine performance concerns; determine needed action. P-1
2. Research vehicle service information, including vehicle service history, service precautions, and technical service bulletins. P-1
3. Diagnose abnormal engine noises or vibration concerns; determine needed action. P-3
4. Diagnose the cause of excessive oil consumption coolant consumption, unusual exhaust color, odor, and sound; determine needed action. P-2
5. Perform engine absolute manifold pressure tests (vacuum/boost); determine needed action. P-1
6. Perform cylinder power balance test; determine needed action. P-2

Georgia Department of Education

7. Perform cylinder cranking and running compression tests; determine needed action. P-1
8. Perform cylinder leakage test; determine needed action. P-1
9. Diagnose engine mechanical, electrical, electronic, fuel, and ignition concerns; determine needed action. P-2
10. Verify engine operating temperature; determine needed action. P-1
11. Verify correct camshaft timing including variable valve timing (VVT) systems. P-1

B. Computerized Controls

1. Retrieve and record diagnostic trouble codes (DTC), OBD monitor status, and freeze frame data; clear codes when applicable. P-1
2. Access and use service information to perform step-by-step (troubleshooting) diagnosis. P-1
3. Perform active tests of actuators using a scan tool; determine needed action. P-2
4. Describe the use of OBD monitors for repair verification. P-1

C. Fuel, Air Induction, and Exhaust Systems

1. Replace fuel filter(s) where applicable. P-2
2. Inspect, service, or replace air filters, filter housings, and intake duct work. P-1
3. Verify idle control operation. P-1
4. Inspect throttle body, air induction system, intake manifold and gaskets for vacuum leaks and/or unmetered air. P-2
5. Inspect integrity of the exhaust manifold, exhaust pipes, muffler(s), catalytic converter(s), resonator(s), tail pipe(s), and heat shields; determine necessary action. P-1
6. Inspect condition of exhaust system hangers, brackets, clamps, and heat shields; determine necessary action. P-1
7. Check and refill diesel exhaust fluid (DEF). P-2

Support of CTAE Foundation Course Standards and Georgia Standards of Excellence

ELACC9-10SL1: Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 9–10 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively.