Escondido Union High School District

Advanced Auto Technology

EUHSD Board Approval Date: 12/12/17
The EUHSD Advanced Auto Technology curriculum document identifies what students should be able to know by grade level in a comprehensive standards-based course of study. The curriculum is aligned to the California Career Technical Education Model Curriculum Standards in the Transportation Industry Sector and the Systems Diagnostics, Service, and Repair Pathway. The Advanced Auto Technology course is the third course in a four-year sequence of courses. The curriculum document is updated annually based on student academic achievement data, research and best practices, and input from stakeholders. The EUHSD curriculum document contains the following documents and/or information:

A. Course Description
B. Course Guidelines/Requirements – graduation credit information, transcript information, adopted materials, adopted technology, assessment outline
C. Instructional Materials References
D. Scope and Sequence Map with Essential Standards outlined by Unit
E. References to key essential design and implementation documents

A comprehensive course of study and/or program is designed so that all students have access to the rigorous curriculum necessary to graduate high school college and career ready. Student-Centered learning provides opportunity for collaboration, communication, and a robust learning environment and provides opportunities for all students to meet the goals of the district’s Instructional Focus at the time of this writing: “All students communicate their thinking, ideas and understanding by effectively using oral, written and/or non-verbal expression.”

A key design consideration in the transition to the new California State Standards is a focus on changes to pedagogy. The English Language Arts instructional shifts guide classroom teaching and learning and the foundation of curriculum and instructional design. Key considerations of the ELA Instructional shifts can be found by visiting the following URL: http://www.corestandards.org/other-resources/key-shifts-in-english-language-arts/.

The curriculum document is aligned to the California Model Career Technical Education Standards and reflects learning outcomes from both the anchor and pathway standards.
## Advanced Auto Technology Course Description

*Advanced Auto Technology* is the third course in a sequence of courses within the Transportation Industry Sector and the Systems, Diagnostics, Service, and Repair Career Pathway. The course was written to align to the skills and competencies outlined within the California Model Career Technical Education Standards. As a third year course, students will, independently and in small group settings, participate in a variety of performance based tasks that build upon the skills and competencies acquired in years 1 and 2. Students will continue to enhance their knowledge of the transportation industry and the careers, education and certification requirements that lead to college and career readiness. Students will receive rigorous training on advanced electrical systems, advanced use of the global impact of the industry, advanced diagnoses and repair of refrigeration system components, troubleshooting OBDI and OBDII system capabilities, advanced training, diagnoses, and repair of emission controls systems, and advanced training, diagnoses, and repair of drive trains and axles.

### Course Requirements

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Grade Level</th>
<th>Transcript Abbreviation (Semester A)</th>
<th>Transcript Abbreviation (Semester B)</th>
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<tbody>
<tr>
<td><strong>Course Length:</strong> Year Long</td>
<td>11-12</td>
<td>ADV AUTO TECH A (P)</td>
<td>ADV AUTO TECH B (P)</td>
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<td><strong>UC/CSU Requirement:</strong> Meets UC/CSU “g” Elective</td>
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<td><strong>Course Number (Semester A):</strong> 6350</td>
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<td><strong>Course Number (Semester B):</strong> 6351</td>
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<td><strong>Credits (Semester A):</strong> 5 CTE or Elective</td>
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<td><strong>Credits (Semester B):</strong> 5 Elective or CTE</td>
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<td><strong>Required Prerequisite/s:</strong></td>
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<td>Concurrent Enrollment or Completion of Math 1 or Algebra 1</td>
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<td><strong>Recommended Prerequisite/s:</strong></td>
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<td>Auto Technology 1 or Teacher Recommendation</td>
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<tr>
<td>Auto Technology 2 or Teacher Recommendation</td>
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<td><strong>Industry Sector:</strong> Transportation</td>
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<td><strong>Career Pathway:</strong> Systems, Diagnostics, Service and Repair</td>
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<td><strong>Board Approval Date (Curriculum):</strong> 12/12/17</td>
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<td><strong>Board Approval Date (Materials):</strong></td>
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### Core Instructional Material/s:


### Supplemental Instructional Material/s:

- *Modern Automotive Technology Workbook*
- *Auto Engine Performance and Drivability*
- *Auto Engine Performance and Drivability* workbook
- Teacher demonstration, video, power point and handouts
- Cars.com
- Tech News Today
- Popular Mechanics
- Carcarenewsservice.org
- Scotty kilmer.com
- [www.tundrasolutions.com](http://www.tundrasolutions.com)
- [www.gm-trucks.com](http://www.gm-trucks.com)
- [www.obd-codes.com](http://www.obd-codes.com)

### Technology Resource/s:

- Various automotive technology resources as outlined in the scope and sequence document
- All Data (software)
- Mitchell On Demand (software)
- ASE (software)
<table>
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<tr>
<th>SP2 (software)</th>
<th>WorkSafe (software)</th>
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**Assessment/s:** The course is designed as a project based curriculum. Each unit outlines specific skills and/or long term projects which serve as unit and course assessments.

**Meeting the Needs of ELs:**

- Utilize the student information system to acquire the language levels of EUHSD English Learners.
- In 2012, the CA Department of Education adopted new language level proficiency descriptors and new EL state standards. Visit the following website to learn more about those new descriptors and corresponding standards: [http://www.cde.ca.gov/sp/er/documents/eldstndspublication14.pdf](http://www.cde.ca.gov/sp/er/documents/eldstndspublication14.pdf)
- In 2014, the CA Department of Education adopted new ELA-ELD Framework, with specific strategies designed to meet the needs of EL students. Visit the following URL to learn more about the new frameworks: [http://www.cde.ca.gov/ci/rlcf/documents/elaelfwchapter11.pdf](http://www.cde.ca.gov/ci/rlcf/documents/elaelfwchapter11.pdf)
The Scope and Sequence Guide is a California standards based and Career Technical Education standards based document that delineates the skills students are expected to know and do in order to meet College and Career Readiness expectations. Each unit of study in the Scope and Sequence document is designed to build upon the previous unit and/or prerequisite coursework in support of student mastery of specific standards based skills. The Scope and Sequence document provides the framework of understanding for key assignments, key assessments, and instructional resources and strategies that serve to assist students in meeting unit learning objectives. The document will be updated annually with input from all stakeholders.

In coursework requiring reading and writing, the following standards are not specifically stated in any one unit of study, but are the result of implementation throughout the curriculum as students participate in reading, writing, and speaking/listening standards based activities.

- **By the end of grade 11, students will read and comprehend literary nonfiction in the grades 11-CCR text completely and proficiently, with scaffolding as needed at the high range.** (Reading Informational Text Standard 10)
- **Students will write routinely over extending time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of tasks and purposes.** (Writing Standard 10)
- “To be college and career ready, students must have ample opportunities to take part in a variety of rich and structured conversations – as part of a whole class, in small groups, and with a partner – build around important content in various domains. They must be able to contribute appropriately to conversations, make comparisons and contrasts, and analyze and synthesize a multitude of ideas according to the standards of evidence appropriate to a particular discipline.” (Standards for ELA Anchor Standards for Speaking/Listening)
**Unit Description:** Unit 1 in Auto 3 is designed to review and enhance the knowledge and competencies acquired in years 1 and 2. Although students have prior knowledge of safe working procedures, all students will be expected to complete a comprehensive hands-on demonstration of safety procedures associated with the use of automotive tools and mechanics, maintenance of the shop, general procedures and safety practices for lifting, working independently and collaboratively. Students will also review proper protocols for addressing incidents and accidents occurring in the classroom and shop setting. Students will be able to recognize, identify, and list the potential hazards of working in an auto shop environment. In year 3, students continue to explore specific certification requirements in the industry, and continue to add to their career portfolio by enhancing their resume and exploring college and career entry level employment and future educational options within the industry sector.

### Unit Standards:

**Transportation Knowledge and Performance Anchor Standards:**

**Communications:**
2.3 Interpret verbal and nonverbal communication and respond appropriately.
2.4 Demonstrate elements of written and electronic communication, such as accurate spelling, grammar, and formatting.
2.5 Communicate information and ideas effectively to multiple audiences using a variety of media and formats.

**Career Planning and Management:**
3.4 Research the scope of career opportunities available and the requirements for education, training, certification, and licensure.
3.9 Develop a career plan that reflects career interests, pathways, and postsecondary options.

**Technology:**
4.1 Use electronic reference materials to gather information.
4.3 Use information and communication technology to synthesize, compare, and contrast information from multiple sources.
4.5 Research past, present, and projected technological advances as they pertain to a particular pathway.

**Health and Safety:**
6.1 Locate and adhere to Material Safety Data Sheet (MSDS) instructions.
6.2 Interpret policies, procedures, and regulations for the workplace environment, including employer and employee responsibilities. (This standard fits into the classroom/workspace environment too.)
6.3 Use health and safety practices for storing, cleaning, and maintaining tools, equipment, and supplies.
6.4 Practice personal safety when lifting, bending, or moving equipment and supplies.
6.5 Demonstrate how to prevent and respond to work-related accidents or injury this includes demonstrating an understanding of ergonomics.

### Learning Objectives:

**Students will be able to...**
- Identify and locate parts of a vehicle.
- Evaluate automotive careers.
- Describe the type of skills needed to be an Auto Technician.
- Identify automotive hand tools.
- List safety rules for hand tools.
- Identify fire exits, wash stations, drainage locations, water shut off valves, nonskid floor mats, and other essential safety equipment.
- Perform and/or identify key personnel to perform basic first aid in the event of an accident or emergency.
- Identify locations for storage of essential equipment, including containers, tools, and mechanical equipment.
- Select the right tool for a given job.
- Maintain and store tools properly.
- Use tools safely.

### Unit Assignments:

**Teacher Note:** Several of the Unit assignments build upon years 1 and 2. Students will continue to keep a digital or print notebook and participate in hands-on safety tests. However, the expectations for years 3 and 4 of the course are at a more advanced and a more independent level. All competencies will be assessed utilizing industry standard requirements and rubrics.

- All students will be expected to keep a digital or print notebook that serves to contain key vocabulary and terminology associated with their industry sector. The notebook will also include key diagrams, key safety notes, and reflection summaries on key performance tasks and assignments completed throughout the course. Students in year 3 will build upon the notebook and portfolio established in years 1 and 2.
- All students will participate in a hands-on safety test demonstrating understanding of key safety procedures for addressing incidents and accidents occurring within the shop and through use of equipment and tools. Students will identify fire exits, wash stations, drainage valves, nonskid floor mats, handling of essential safety equipment, etc. Students will be expected to identify these elements within the classroom and participate in a safety test where they must demonstrate safety procedures with 100% accuracy. Year 3 students will be expected to recall information from years 1 and 2 and will be expected to complete these tasks independently, as well as working alongside year 1 and 2 students, when applicable, in a trainer of trainer’s capacity, illustrating the knowledge and competencies acquired in years 1 and 2.
- Students will complete a comprehensive review of the tools and machines available within the automotive lab setting. They will review the routine maintenance of each tool, proper storage...
Leadership and Teamwork:
9.3 Understand the characteristics and benefits of teamwork, leadership, and citizenship in the school, community, and workplace setting.
9.4 Explain how professional associations and organizations and associated leadership development and competitive career development activities enhance academic preparations, promote career choices and contribute to employment opportunities.

Technical Knowledge and Skills:
10.1 Interpret and explain terminology and practices specific to the Transportation sector.

Demonstration and Application:
11.2 Demonstrate proficiency in a career technical pathway that leads to certification, licensure, and/or continued learning at the post-secondary level.
11.5 Create a portfolio or similar collection of work that offers evidence through assessment and evaluation of skills and knowledge competency in the anchor standards, pathway standards, and performance indicators. (Students will create the portfolio beginning in Unit 1 and showcase work throughout the course of study.)

Transportation Pathway Standards:

Systems Diagnostics, Service, and Repair Pathway:
C1.0 Demonstrate the practice of personal and occupational safety and protecting the environment by using materials and processes in accordance with manufacturer and industry standards.
C1.1 Know and understand common environmental conservation practices and their applications.
C1.2 Practice the safe handling and storage of chemicals and hazardous wastes in accordance with material safety data sheets and the requirements of local, state, and federal regulatory agencies.
C1.3 Understand the way in which waste gases, emissions, and other environmentally destructive substances are generated and the effects of these substances on the environment.
C1.4 Use appropriate personal protective equipment and safety practices.
C2.0 Practice the safe and appropriate use of tools, equipment, and work processes.
C2.1 Recognize the importance of calibration processes, systems, and techniques using various measurements and testing devices.
C2.2 Demonstrate and use appropriate tools and equipment—such as wrenches, sockets, and pliers—to diagnose, service, repair, and maintain systems and components.
C2.3 Use tools, equipment, and machines to safely measure, test, diagnose, and analyze components and systems (e.g., electrical and electronic circuits, alternating- and direct-current applications, fluid/hydraulic and air/pneumatic systems).

● Describe safety precautions to be taken in an automotive shop.
● Explain the advantages of one tool type over another.
● Explain safety rules that pertain to power tools and equipment.
● Explain the types of accidents that can occur in an auto shop.
● Explain how to prevent auto shop accidents.

100% accuracy prior to using any tool and/or piece of equipment.

Tool Skills Test - Students will be given a sample project and will be required to select the appropriate tools and justify their selections. Select and justify the appropriate tools for a given project. Students in Year 3 will select from a variety of sample projects and will need to complete at least three different tasks in the tool skills tests.

Students will attend a job shadow presentation set up by their instructor. Year 3 students may be completing an internship and/or may also be participating in a part time work experience or other after school work related employment opportunity. In year 2, students also participated in a job shadow presentation. Those students in year 3 of the course may continue with the same experience, but at a more advanced level or participate in a new job shadow opportunity. The purpose of the job shadow presentation is to showcase student competencies in the industry sector, to enhance the student's career resume, and to provide hands-on industry experiences in real world settings. All of the students in the year 2 & 3 course are expected to complete a job shadow experience. In order to introduce the concept of a “job shadow”, the students will hear from an industry expert in the transportation industry. Students will learn about the various duties and experiences of a worker through a “shadow” experience. The experience will allow the student to learn firsthand the types of career skills and dispositions needed in specific fields. Students will write a 1-page reflection of the industry experts presentation and will identify an area of interest for their own job shadow experience. Students will also begin conducting research on the types of careers available in an ever-changing industry. They will write a 1-page paper on a specific career, which will include the educational requirements and job outlook as part of their ongoing research in career exploration within the industry. Students will also be introduced to the ASE (Automotive Service Excellence) certification process and will begin to examine the skills and dispositions required in order to receive certification.
C2.4 Select and use the appropriate measurement device(s) and use mathematical functions necessary to perform required fabrication, maintenance, and operation procedures.
C2.5: Use measurement scales, devices, and systems, such as dial indicators and micrometers, to design, fabricate, diagnose, maintain, and repair vehicles and components following recommended industry standards.
C2.7 Test and analyze the elements of precisions measuring using standard and metric systems.

CTE Reading Standards:
9-10.5 Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy).
11-12.4 Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9-12 texts and topics.
9-10.8 Gather relevant information from multiple authoritative print and digital sources (primary and secondary) using advanced searches effectively: assess the usefulness of each source in answering the research questions; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citations.

**Instructional Resources:**

**Core Text:**
- *Modern Automotive Technology* 7th ed. (chapters 1-5 and 80)
- *Auto Engine Performance and Drivability* (chapter 22)

**Supporting Text:**
- *Modern Automotive Technology* Workbook
- *Auto Engine Performance and Drivability* (chapter 2 and 22)
- *Auto Engine Performance and Drivability* workbook
- Online Text(s)

**Supplemental Resources:**
- Automotive Service Excellence (ASE)
- CALJOBS
- All Data
- Mitchell On Demand

**Unit Assessments:**
- Teachers create day-to-day formative assessments that guide instructional decision-making.
- A safety procedures test - with 100% accuracy.
- Shop procedures
**Advanced Auto Technology Scope and Sequence**  
**Unit 2 – Automotive Electrical Meter Certification**  
**Length: 4 Weeks**

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<thead>
<tr>
<th>Unit Description:</th>
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<tr>
<td>In Unit 2, students will participate in rigorous training on the advanced capabilities of digital multimeters utilizing the same technologies found within the professional workplace setting. Advanced training is focused on subjects ranging from basic and advanced automotive electrical systems. Students will be expected to troubleshoot, diagnose, and provide a complete and comprehensive analysis of repair issues, including creating cost estimates of required repair tasks.</td>
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<tr>
<th>Learning Objectives:</th>
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<tr>
<td>Students will be able to...</td>
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<tr>
<td>• Diagnose ignition system related problems such as no starting, hard starting, engine misfire, poor drive availability, spark knock, power loss, poor mileage, and emission concerns; determine necessary action.</td>
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<td>• Explain the purpose and operation of on board diagnostic systems.</td>
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<td>• Digital Multi Meter (DMM) familiarity.</td>
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<td>• Understand electrical diagnostic methods.</td>
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<tr>
<th>Unit Assignments:</th>
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<tr>
<td>Because this is a year 3 course, all of the tasks are designed to lead to transportation industry certification. Students will be expected to complete the following performance tasks:</td>
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<td>• Identify and interpret electrical/electronic system concerns, determine necessary action.</td>
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<td>• Research applicable electrical electronic system operation. Vehicle service history, service precautions, and technical bulletins.</td>
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<td>• Diagnose electrical/electronic integrity of series, parallel, and series-parallel circuits using principles of electricity (OHM’s law).</td>
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<td>• Use wiring diagram during diagnosis of electrical circuit problems.</td>
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<td>• Demonstrate the proper use of a digital multimeter (DMM) during diagnosis of electrical circuit problem including: source voltage, voltage drop, current flow, and resistance.</td>
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<td>• Determine potential problems are caused by electrical faults.</td>
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<td>• Perform a visual inspection of the electrical system.</td>
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<td>• Perform electrical tests and be assessed using industry standard rubrics that identify student areas of strength and growth.</td>
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<td>• Measure and diagnose the causes of excessive parasitic draw; Determine necessary action.</td>
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<td>• Students will be expected to assess their own knowledge of skills and competencies in working with electrical systems. They will write a 1-2 page reflection of each task and will add them to their portfolio. Students will also research specialized fields of study in the area of electrical systems and will add this information to their career exploration portfolio tasks.</td>
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### Leadership and Teamwork:
9.3 Understand the characteristics and benefits of teamwork, leadership, and citizenship in the school, community, and workplace setting.
9.4 Explain how professional associations and organizations and associated leadership development and competitive career development activities enhance academic preparations, promote career choices and contribute to employment opportunities.

### Technical Knowledge and Skills:
10.1 Interpret and explain terminology and practices specific to the Transportation sector.

### Demonstration and Application:
11.2 Demonstrate proficiency in a career technical pathway that leads to certification, licensure, and or continued learning at the post-secondary level.
11.5 Create a portfolio or similar collection of work that offers evidence through assessment and evaluation of skills and knowledge competency in the anchor standards, pathway standards, and performance indicators. (Students will create the portfolio beginning in Unit 1 and showcase work throughout the course of study.)

### Pathway Standards:
**Structural Repair and Refinishing Pathway:**
B2.1 Understand how certain tools and equipment are used to perform maintenance and repair operations.

### CTE Reading Standards:
9-10.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text.
9-10.4 Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9-12 texts and topics.
9-10.5 Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy).
11-12.4 Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9-12 texts and topics.

### Instructional Resources:
- **Core Text:**
  - *NC3 Certification*

### Unit Assessments:
- Certification Test
- A safety procedures test - with 100% accuracy.
- Students will both individually and collaboratively correctly identify and explain flow of electricity.
<table>
<thead>
<tr>
<th>Supporting Text:</th>
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<tbody>
<tr>
<td><em>Modern Automotive Technology</em> Workbook</td>
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<tr>
<td><em>Modern Automotive Technology 7th Edition</em> (chapter8)</td>
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<td><em>Auto Engine Performance and Drivability</em> (chapters 6-14)</td>
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<td>Teacher demonstration, video, PowerPoint and handouts</td>
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- Students will both individually and collaboratively correctly identify and locate electrical systems components.
- Students will both individually and collaboratively correctly identify and perform maintenance and service on electrical systems.
- Students will both individually and collaboratively correctly explain how temperature and other factors effect electrical systems.
Advanced Auto Technology Scope and Sequence
Unit 3 – Automotive Measurement and Technical Math
Length: 6 Weeks

Unit Description: In Unit 3, students will continue to expand upon their knowledge of automotive measurement and use of technical math skills. Students will describe the most common measurement systems in the automotive industry and will discuss how mathematics are an integral part of transportation technology. They will use a variety of measuring systems, measuring tools, and other measuring devices. Students will be expected to follow precise complex multistep procedures when taking measurements or performing technical tasks. They will use key symbols, terminology, and other specific technical terms associated with the industry.

Unit Standards:

Pathway Standards:
C2.0 Practice the safe and appropriate use of tools, equipment, and work processes.
C2.1 Recognize the importance of calibration processes, systems, and techniques using various measurement and testing devices.
C2.2 Demonstrate and use appropriate tools and equipment—such as wrenches, sockets, and pliers—to diagnose, service, repair, and maintain systems and components.
C2.3 Use tools, equipment, and machines to safely measure, test, diagnose, and analyze components and systems (e.g., electrical and electronic circuits, alternating- and direct-current applications, fluid/hydraulic and air/pneumatic systems).
C2.4 Select and use the appropriate measurement device(s) and use mathematical functions necessary to perform required fabrication, maintenance, and operation procedures.
C2.5 Use measurement scales, devices, and systems, such as dial indicators and micrometers, to design, fabricate, diagnose, maintain, and repair vehicles and components following recommended industry standards.
C2.6 Demonstrate how to access technical reports, manuals, electronic retrieval systems, and related technical data resources.
C2.7 Test and analyze the elements of precision measuring using standard and metric systems.

CTE Writing Standards:
9-10.8 Gather relevant information from multiple authoritative print and digital sources (primary and secondary) using advanced searches effectively; assess the usefulness of each source in answering the research questions; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citations.

Math Standards:
G-MG2 Apply concepts of density based on area and volume in modeling situations.

Learning Objectives:

Students will be able to...
- Describe both customary and metric measuring systems; identify basic measuring tools; describe the use of common measuring tools; use conversion charts; list safety rules relating to measurement; summarize basic math facts.

Unit Assignments:
Throughout the course students will be expected to utilize their measurement and technical math skills as they perform a variety of hands-on performance based tasks requiring sophisticated and detailed measurements. Students will research and describe both customary and metric measuring systems utilized within the industry. They will identify basic measuring tools and will participate in a series of oral performance based tasks requiring them to describe tool's use and function within the industry. Students will create and use conversation charts and computer applications to complete a series of measurement tasks.

Instructional Resources:

Unit Assessments:
<table>
<thead>
<tr>
<th>Core Text:</th>
<th>• <em>Modern Automotive Technology</em> 7th ed. (chapter 6)</th>
<th>• Students will correctly answer ASE certification test questions that require a basic understanding of measurement and math.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supporting Text:</td>
<td>• <em>Modern Automotive Technology</em> Workbook</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Online Text(s)</td>
<td></td>
</tr>
<tr>
<td>Supplemental Resources:</td>
<td>• Automotive Service Excellence (ASE)</td>
<td></td>
</tr>
</tbody>
</table>
### Unit Description:
In Unit 4, students will be expected to diagnose and repair the heating ventilation and air conditioning systems within the transportation industry sector. Students will be expected to cite the ways in which improper handling of air conditioning refrigerant effect the environment, list the ways in which pressure and temperature relate to heating and air conditioning systems, and compare and contrast the different types of air conditioning compressors.

### Unit Standards:
- **C2.0** Practice the safe and appropriate use of tools, equipment, and work processes.
- **C2.1** Recognize the importance of calibration processes, systems, and techniques using various measurement and testing devices.
- **C2.2** Demonstrate and use appropriate tools and equipment—such as wrenches, sockets, and pliers—to diagnose, service, repair, and maintain systems and components.
- **C2.3** Use tools, equipment, and machines to safely measure, test, diagnose, and analyze components and systems (e.g., electrical and electronic circuits, alternating- and direct-current applications, fluid/hydraulic and air/pneumatic systems).
- **C2.4** Select and use the appropriate measurement device(s) and use mathematical functions necessary to perform required fabrication, maintenance, and operation procedures.
- **C2.5** Use measurement scales, devices, and systems, such as dial indicators and micrometers, to design, fabricate, diagnose, maintain, and repair vehicles and components following recommended industry standards.
- **C3.0** Use scientific principles in relation to chemical, mechanical, and physical functions for various engine and vehicle systems.
- **C3.1** Describe the operating principles of internal and/or external combustion engines.
- **C3.2** Describe the function and principles of air-conditioning and heating systems.
- **C3.3** Describe the basic principles of pneumatic and hydraulic power and their applications.
- **C3.4** Describe the applications of alternative power sources.
- **C3.5** Practice the basic principles of electricity, electronics and electrical power generation, and distribution systems.
- **C3.6** Explain the principles of converting energy from one form to another.
- **C3.7** Perform necessary procedures to maintain, diagnose, service, and repair vehicle systems and malfunctions.
- **C4.0** Perform and document maintenance procedures in accordance with the recommendations of the manufacturer.

### Learning Objectives:
**Students will be able to…**
- In this unit, students will practice refrigeration system component diagnosis by researching applicable vehicle and service information (including the use of technical service bulletins (TSB’s), campaigns, and recalls), vehicle service history, and service precautions.
- Students will identify vehicle A/C system electrical circuits and service/safety precautions; and inspect A/C condenser for airflow restrictions and identify necessary action.
- In this unit, students practice operating systems and related controls diagnosis by inspecting A/C heater ducts, doors, hoses, cabin filters, and outlets and identify necessary action.
- Students will demonstrate in the lab/shop their knowledge of heating and air conditioning by successfully completing the related tasks.

### Unit Assignments:
In order to demonstrate proficiency in meeting industry standard certification requirements in refrigeration systems, students will practice refrigeration system component diagnoses by researching applicable vehicle and service information, which will include the use of technical service bulletins (TSBs), campaigns, and recalls, vehicle service history, and service precautions. Students will identify the specific components of A/C system electrical circuits and service/safety precautions. They will be expected to perform routine inspections using industry standard requirements for airflow restrictions and diagnose a course of action. Students will inspect A/C heater ducts, doors, hoses, cabin filters, and outlets. They will demonstrate their lab-shop knowledge of heating and air conditioning through successful completion of inspection tasks.
- Students will use a variety of technical information documents and research and explain the principles of refrigeration. They will write a 1-2-page bulleted paper that summarizes the operation and interaction of heating, ventilation, and air conditioning systems. The students will describe specific safety precautions to be observed when working on heating and air conditioning systems. All students will correctly answer ASE certification test questions related to Refrigeration System Components Diagnosis and Repair.
C4.1 Communicate the procedures and practices of various manufacturers regarding service, repair, and maintenance schedules.
C4.2 Demonstrate how to properly document maintenance and repair procedures in accordance with applicable rules, laws, and regulations (e.g., Bureau of Auto Repair [BAR], Occupational Safety and Health Administration [OSHA], and the California Air Resources Board [ARB]).
C4.3 Use reference books, technical service bulletins, and other documents and materials related to the service industry available in print and through electronic retrieval systems to accurately diagnose and repair systems, equipment, and vehicles.
C4.4 Complete a work order, including customer information, description of repairs, and billing information, in accordance with applicable rules, laws, and regulations.

<table>
<thead>
<tr>
<th>Instructional Resources:</th>
<th>Unit Assessments:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Core Text:</td>
<td>Teachers create day-to-day formative assessments that guide instructional decision-making.</td>
</tr>
<tr>
<td>● Modern Automotive Technology 7th ed. (chapters 75 and 76)</td>
<td>Students will correctly answer ASE certification test questions.</td>
</tr>
<tr>
<td>Supporting Text:</td>
<td></td>
</tr>
<tr>
<td>● Modern Automotive Technology Workbook</td>
<td></td>
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<tr>
<td>● Online Text(s)</td>
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<tr>
<td>Supplemental Resources:</td>
<td></td>
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<tr>
<td>● Automotive Service Excellence (ASE)</td>
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<tr>
<td>● All Data</td>
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<tr>
<td>● Mitchell On Demand</td>
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<td>● Cars.com</td>
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<td>● Tech News Today</td>
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<td>● Popular Mechanics</td>
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<tr>
<td>● Carecarenewsservice.org</td>
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<tr>
<td>● Scotty kilmer.com</td>
<td></td>
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<tr>
<td>● Eric the car guy.com</td>
<td></td>
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<tr>
<td>● <a href="http://www.tundrasolutions.com">www.tundrasolutions.com</a></td>
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<tr>
<td>● <a href="http://www.gm-trucks.com">www.gm-trucks.com</a></td>
<td></td>
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<tr>
<td>● <a href="http://www.obd-codes.com">www.obd-codes.com</a></td>
<td></td>
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</tbody>
</table>
Advanced Auto Technology Scope and Sequence
Unit 5- Trouble Shooting ORBII
Length: 3 Weeks

**Unit Description:** Unit 5 guides students through the current and emerging technologies in On Board Diagnostics. Students will research and identify the key industry capabilities of on board diagnostic systems and the information that is available to the vehicle's owner or repair technician in assessing the status of various vehicle subsystems - OBDI and OBDII.

**Unit Standards:**

**Pathway Standards: Systems Diagnostics, Service, and Repair:**

<table>
<thead>
<tr>
<th>Standard</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>C1.5</td>
<td>Evaluate the advantages and disadvantages of existing, new, and emerging systems and the effects of those systems on the environment.</td>
</tr>
<tr>
<td>C2.0</td>
<td>Practice the safe and appropriate use of tools, equipment, and work processes.</td>
</tr>
<tr>
<td>C2.1</td>
<td>Recognize the importance of calibration processes, systems, and techniques using various measurements and testing devices.</td>
</tr>
<tr>
<td>C4.0</td>
<td>Perform and document maintenance procedures in accordance with the recommendations of the manufacturer.</td>
</tr>
<tr>
<td>C4.1</td>
<td>Communicate the procedures and practices of various manufacturers regarding service, repair, and maintenance schedules.</td>
</tr>
<tr>
<td>C4.2</td>
<td>Demonstrate how to properly document maintenance and repair procedures in accordance with applicable rules, laws, and regulations (e.g., Bureau of Auto Repair [BAR], Occupational Safety and Health Administration [OSHA], and the California Air Resources Board [ARB]).</td>
</tr>
<tr>
<td>C4.3</td>
<td>Use reference books, technical service bulletins, and other documents and materials related to the service industry available in print and through electronic retrieval systems to accurately diagnose and repair systems, equipment, and vehicles.</td>
</tr>
<tr>
<td>C4.4</td>
<td>Complete a work order, including customer information, description of repairs, and billing information, in accordance with applicable rules, laws, and regulations.</td>
</tr>
</tbody>
</table>

**Learning Objectives:**

Students will be able to...

- Use the on-board diagnostic system.
- Scan computer problems using various scan tools.
- Energizing OBDI systems without a scan tool.
- Erasing trouble codes.
- Describe the use of different types of scan tools.

**Unit Assignments:**

The amount of diagnostic information available via the OBD has been greatly enhanced through the use of various automotive technologies. Students will research and explore the on board diagnostic systems in both new and late model vehicles in order to better understand the new data available for system's diagnoses. Students will detect a variety of problems, will write up summary notes for customers, and will cite specific costs analysis associated with repairs. These tasks will assist students in communicating status of vehicle systems notifications to customers in real-world job settings. Students will complete the following performance tasks in order to demonstrate competency in OBDI and OBDII technologies. Upon completion:

- Discuss the purpose and operation of on-board diagnostic systems.
- Explain the use of scan tools to simplify reading of trouble codes.
- Compare OBD I and OBD II system capabilities and procedures.
- Locate the data link connector on most make and model cars.
- Activate onboard diagnostics with and without scan tool.
- Use a trouble code chart in a service manual or code conversion by a scan tool.
- Erase diagnostic trouble codes.
- Explain how efficiency is obtained by electronic engine controls.
- Select and justify the appropriate tools for a given project.
- Maintain appropriate shop management.
<table>
<thead>
<tr>
<th>Instructional Resources:</th>
<th>Unit Assessments:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Core Text:</td>
<td></td>
</tr>
<tr>
<td>● <em>Modern Automotive Technology</em> 7th ed. (chapter 46)</td>
<td>• Teachers create day-to-day formative assessments that guide instructional decision-making.</td>
</tr>
<tr>
<td>● <em>Auto Engine Performance and Drivability</em> (chapter 13)</td>
<td>• A safety procedures test - with 100% accuracy.</td>
</tr>
<tr>
<td>Supporting Text:</td>
<td>• Shop procedures</td>
</tr>
<tr>
<td>● <em>Modern Automotive Technology</em> Workbook</td>
<td></td>
</tr>
<tr>
<td>● <em>Auto Engine Performance and Drivability</em></td>
<td></td>
</tr>
<tr>
<td>● <em>Auto Engine Performance and Drivability</em> workbook</td>
<td></td>
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<tr>
<td>● Online Text(s)</td>
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<tr>
<td>Supplemental Resources:</td>
<td></td>
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<tr>
<td>● Automotive Service Excellence (ASE)</td>
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<tr>
<td>● All Data</td>
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<tr>
<td>● Mitchell On Demand</td>
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</tbody>
</table>
### Unit Description:
Students will strategize for diagnosing and repairing problems with the emission control system.

### Unit Standards:

<table>
<thead>
<tr>
<th>Standard</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>C2.0</td>
<td>Practice the safe and appropriate use of tools, equipment, and work processes.</td>
</tr>
<tr>
<td>C2.1</td>
<td>Recognize the importance of calibration processes, systems, and techniques using various measurement and testing devices.</td>
</tr>
<tr>
<td>C2.2</td>
<td>Demonstrate and use appropriate tools and equipment—such as wrenches, sockets, and pliers—to diagnose, service, repair, and maintain systems and components.</td>
</tr>
<tr>
<td>C2.3</td>
<td>Use tools, equipment, and machines to safely measure, test, diagnose, and analyze components and systems (e.g., electrical and electronic circuits, alternating- and direct-current applications, fluid/hydraulic and air/pneumatic systems).</td>
</tr>
<tr>
<td>C2.4</td>
<td>Select and use the appropriate measurement device(s) and use mathematical functions necessary to perform required fabrication, maintenance, and operation procedures.</td>
</tr>
<tr>
<td>C2.5</td>
<td>Use measurement scales, devices, and systems, such as dial indicators and micrometers, to design, fabricate, diagnose, maintain, and repair vehicles and components following recommended industry standards.</td>
</tr>
<tr>
<td>C4.0</td>
<td>Perform and document maintenance procedures in accordance with the recommendations of the manufacturer.</td>
</tr>
</tbody>
</table>

### Learning Objectives:

Students will be able to…
- Describe common state emissions testing programs.
- Diagnose problems with components in the emissions control system.
- Perform an exhaust gas analysis.
- Diagnose and repair problems in the emissions control system.
- Diagnose and repair problems in the EGR system.
- Diagnose and repair problems in the PCV system.
- Understand global issues of air pollution.

### Unit Assignments:

- Students will work independently and in small two or three person teams to examine emerging emissions technologies and data requirements. Through websites such as http://www.dmv.org/cacalifornia/smog-check.php, students will cite specific emissions laws and regulations and will complete a quiz of the rules and regulations. Students will also complete a series of performance based tasks utilizing industry standard rubrics that serve to:
  - Explain how efficiency is obtained by electronic engine controls.
  - Describe the operation of the electronic control module.
  - Explain the use of exhaust gas analyzers.
  - Explain the operation of major input sensors.
  - Explain the operation of major output sensors.
  - Repair/Replace major input and output sensors.
  - Identify the key elements of an OBD II system.
  - Inspect and troubleshoot emissions control system.
  - Perform periodic service operations on emissions control systems.
  - Replace or repair major emission control components.
  - Determine if a potential problem is caused by an electrical fault.
  - Test individual emission control components.
  - Install flow meter to check catalytic converter blockage.

### Instructional Resources:

### Unit Assessments:
Core Text:
- *Modern Automotive Technology* 7th ed. (chapters 43 and 44)
- *Auto Engine Performance and Drivability* (chapters 10 and 18)

Supporting Text:
- *Modern Automotive Technology* Workbook
- *Auto Engine Performance and Drivability* workbook
- Online Text(s)

Supplemental Resources:
- Automotive Service Excellence (ASE)
- SP2
- WorkSafe
- Teacher Demonstration, Video, PowerPoint and Handouts

- Chapter test
- Students will both individually and collaboratively correctly identify and explain emission control system parts.
- Students will both individually and collaboratively describe the major types of internal engine modifications designed to control emissions.
- Students will both individually and collaboratively correctly identify and perform maintenance and service on the exhaust system.
### Advanced Auto Technology Scope and Sequence

**Unit 7: Drive Trains and Axels**

**Length: 14 Weeks**

**Unit Description:** Unit 7 is the culminating unit of study within the Automotive 3 course. Students will practice general drive train diagnosis and repair by researching applicable vehicle and service information (including the use of technical service bulletins (TSBs), campaigns, and recalls, vehicle service history, service precautions, and customer complaints. Students will also complete a series of performance based tasks that serve to showcase their understanding of the industry standards required in a variety of tasks completed throughout the course. This will include a career showcase where the students will highlight two or three of their performance based tasks completed throughout the year and present to their peers, instructor, and industry experts.

**Pathway Standards: Systems Diagnostics, Service, and Repair:**

C2.0 Practice the safe and appropriate use of tools, equipment, and work processes.
C2.1 Recognize the importance of calibration processes, systems, and techniques using various measurement and testing devices.
C2.2 Demonstrate and use appropriate tools and equipment—such as wrenches, sockets, and pliers—to diagnose, service, repair, and maintain systems and components.
C2.3 Use tools, equipment, and machines to safely measure, test, diagnose, and analyze components and systems (e.g., electrical and electronic circuits, alternating- and direct-current applications, fluid/hydraulic and air/pneumatic systems).
C2.4 Select and use the appropriate measurement device(s) and use mathematical functions necessary to perform required fabrication, maintenance, and operation procedures.
C2.5 Use measurement scales, devices, and systems, such as dial indicators and micrometers, to design, fabricate, diagnose, maintain, and repair vehicles and components following recommended industry standards.
C4.0 Perform and document maintenance procedures in accordance with the recommendations of the manufacturer.
C4.1 Communicate the procedures and practices of various manufacturers regarding service, repair, and maintenance schedules.
C4.2 Demonstrate how to properly document maintenance and repair procedures in accordance with applicable rules, laws, and regulations (e.g., Bureau of Auto Repair [BAR], Occupational Safety and Health Administration [OSHA], and the California Air Resources Board [ARB]).
C4.3 Use reference books, technical service bulletins, and other documents and materials related to the service industry available in print and through electronic resources.

**Unit Assignments:**

Students will complete a series of performance based tasks relative to drive trains and axles. They will be expected to:

- Explain the operation of the clutch.
- Describe transmission/transaxle components.
- Explain the basic operation of a transfer case.
- How do you find the gear ratio of two gears?
- What are the symptoms of clutch slippage?
- Why do you need an alignment or pilot shaft when installing a clutch?
- List the five functions of a planetary gear set.
- Define the term "stall speed".
- Where do automatic transmission oil leaks commonly occur?
- List and explain the five major parts of a driveshaft.
- How do you check for worn universal joints?
- Explain the difference between a hunting gear set and a non-hunting gear set.
- List the basic parts of an automotive clutch.
- Identify drive train components having an effect on drivability and performance.
- Explain how transmission and transaxle problems can effect drivability.
- Explain how final drive ratios can effect performance and fuel economy.
- Explain gear ratios including overdrive.
- Trace the power flow through transmission gears.

<table>
<thead>
<tr>
<th>Pathway Standards: Systems Diagnostics, Service, and Repair</th>
<th>Learning Objectives:</th>
<th>Unit Assessments/Performance Tasks:</th>
</tr>
</thead>
<tbody>
<tr>
<td>C2.0 Practice the safe and appropriate use of tools, equipment, and work processes.</td>
<td>Students will be able to...</td>
<td>- Explain the operation of the clutch.</td>
</tr>
<tr>
<td>C2.1 Recognize the importance of calibration processes, systems, and techniques using various measurement and testing devices.</td>
<td>- Explain the basic purpose of manual clutches and torque converters.</td>
<td></td>
</tr>
<tr>
<td>C2.2 Demonstrate and use appropriate tools and equipment—such as wrenches, sockets, and pliers—to diagnose, service, repair, and maintain systems and components.</td>
<td>- Describe transmission/transaxle components.</td>
<td></td>
</tr>
<tr>
<td>C2.3 Use tools, equipment, and machines to safely measure, test, diagnose, and analyze components and systems (e.g., electrical and electronic circuits, alternating- and direct-current applications, fluid/hydraulic and air/pneumatic systems).</td>
<td>- Compare clutch design differences.</td>
<td></td>
</tr>
<tr>
<td>C2.4 Select and use the appropriate measurement device(s) and use mathematical functions necessary to perform required fabrication, maintenance, and operation procedures.</td>
<td>- Adjust a clutch.</td>
<td></td>
</tr>
<tr>
<td>C2.5 Use measurement scales, devices, and systems, such as dial indicators and micrometers, to design, fabricate, diagnose, maintain, and repair vehicles and components following recommended industry standards.</td>
<td>- Remove, repair, and install a clutch.</td>
<td></td>
</tr>
<tr>
<td>C4.0 Perform and document maintenance procedures in accordance with the recommendations of the manufacturer.</td>
<td>- Explain the purpose and operation of transmission overdrive ratio’s.</td>
<td></td>
</tr>
<tr>
<td>C4.1 Communicate the procedures and practices of various manufacturers regarding service, repair, and maintenance schedules.</td>
<td>- Cite and observe safety rules for transmission service.</td>
<td></td>
</tr>
<tr>
<td>C4.2 Demonstrate how to properly document maintenance and repair procedures in accordance with applicable rules, laws, and regulations (e.g., Bureau of Auto Repair [BAR], Occupational Safety and Health Administration [OSHA], and the California Air Resources Board [ARB]).</td>
<td>- Explain how an automatic transmission shifts gears.</td>
<td></td>
</tr>
<tr>
<td>C4.3 Use reference books, technical service bulletins, and other documents and materials related to the service industry available in print and through electronic resources.</td>
<td>- List and describe the major parts of the hydraulic system in an automatic transmission.</td>
<td></td>
</tr>
</tbody>
</table>

**Unit Assignments:**

Students will also complete a series of performance based tasks relative to drive trains and axels. They will be expected to:

- Explain the basic purpose of manual clutches and torque converters.
- Describe transmission/transaxle components.
- Compare clutch design differences.
- Adjust a clutch.
- Remove, repair, and install a clutch.
- Explain the purpose and operation of transmission overdrive ratio’s.
- Cite and observe safety rules for transmission service.
- Explain how an automatic transmission shifts gears.
- List and describe the major parts of the hydraulic system in an automatic transmission.
- Explain how the shift valves work in an automatic transmission.
- Change automatic transmission oil and filter.
- Change manual transmission fluid.
- List the functions of a rear axle assembly.
- Describe the operation of a differential.
- Relate rear axle ratios to vehicle performance.
- Check and replace rear axle lubricant.
- Remove and replace axle, axle bearings, and seals.
- Diagnose common differential and rear drive axle problems.
retrieval systems to accurately diagnose and repair systems, equipment, and vehicles.

C4.4 Complete a work order, including customer information, description of repairs, and billing information, in accordance with applicable rules, laws, and regulations.

C5.0 Apply and understand appropriate business practices.
C5.1 Identify work-related systems common to the transportation service industry.
C5.2 Know the laws and regulations applicable to recordkeeping and the appropriate handling and disposal of hazardous materials.

C5.3 Explain the importance of and the procedures for maintaining accurate records (e.g., business licenses, repair orders, billing and tax records).
C5.4 Practice the concept and application of accepted ethical business practices.
C5.5 Practice the concept and application of acceptable customer relations practices.

C5.6 Recognize, analyze, and evaluate the need for maintenance of components and systems and the conditions under which service and maintenance are required.

C8.0 Demonstrate the function and principles of automotive drivetrain, steering and suspension, brake, and tire and wheel components and systems in accordance with national industry standards.

C8.1 Describe how to maintain, diagnose, service, and repair hydraulic and power assist systems.
C8.2 Describe the function and operation of automatic and manual transmissions and transaxles.
C8.3 Diagnose, service, and repair disc brakes, drum brakes, antilock brakes, and other brake systems as developed.
C8.4 Diagnose, service, and repair steering and suspension systems.
C8.5 Interpret tire and rim sizing to select appropriate wheels and tires for vehicles.
C8.6 Maintain, diagnose, service, and repair under-vehicle systems and malfunctions.

- Remove and replace a manual/automatic transmission.
- Explain the functions of a driveshaft.
- Describe the different types of universal joints.
- List the different drive lines.

For their end of course culminating activity, students will select 2-3 performance based tasks completed throughout the year. The student will present his/her diagnostic analysis, repair estimate and cost analysis, as well as cite rationale for diagnostic analysis to the class. This will include a written summary of the details of each task as well as the reflection of learning from the specific task - challenges, etc. Students will draw upon various informational texts in preparing their research, and will cite specific sources utilizing APA formatting.
**Instructional Resources:**

**Core Text:**
- *Modern Automotive Technology* 7th ed. (chapters 53 and 64)
- *Auto Engine Performance and Drivability* (chapters 11 and 20)

**Supporting Text:**
- *Modern Automotive Technology* Workbook
- *Auto Engine Performance and Drivability* Workbook
- *Auto Engine Performance and Drivability* workbook
- Online Text(s)

**Supplemental Resources:**
- Automotive Service Excellence (ASE)
- All Data
- Mitchell On Demand
- CTE Online

**Unit Assessments:**
- Teachers create day-to-day formative assessments that guide instructional decision-making.
- Students will correctly answer ASE certification test questions that require a knowledge of clutch designs and operation.
- Students will correctly answer ASE certification test questions that require a knowledge of manual and automatic transmission operating principles.