Escondido Union High School District

Automotive Technology 1

EUHSD Board Approval Date: 6/21/16
The EUHSD Automotive Technology 1 curriculum document identifies what students should be able to know by grade level in a comprehensive standards-based course of study and in a sequenced Career Technical Education pathway. The curriculum document will be 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

**Escondido Union High School District – Instructional Focus**

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.”

**Curriculum Design Resources**

The curriculum document is aligned to the Model Career Technical Education Standards as well as the most current industry standards and expectations in the transportation industry. Documents and websites utilized in support of this curriculum are as follows:

2. [http://www.sae.org](http://www.sae.org) - SAE International is a global association of more than 138,000 engineers and related technical experts in the aerospace, automotive and commercial-vehicle industries. SAE International's core competencies are lifelong learning and voluntary consensus standards development. SAE International's charitable arm is the SAE Foundation, which supports many programs, including A World In Motion® and the Collegiate Design Series.
**Automotive Technology 1 Course Description**

*Automotive Technology 1* – Students enrolled in Automotive Technology 1 will begin building a foundational understanding of transportation practices and basic skills. Both classroom and hands-on lab experiences are designed to cover maintenance, electrical systems, lubrication expectations, and cooling and fuel systems. Students will also review and demonstrate learning on the following automotive systems: brakes, steering and suspension, front-end alignment, power train and air conditioning. This is a beginning class in a pathway of courses designed to assist students in the college and career readiness skills in the transportation industry sector.

<table>
<thead>
<tr>
<th>Course Requirements</th>
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<tbody>
<tr>
<td><strong>Course Length:</strong></td>
<td>Year Long</td>
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<tr>
<td><strong>UC/CSU Requirement:</strong></td>
<td>Approved as a UC “g” Elective</td>
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<tr>
<td><strong>Course Number ( Semester A):</strong> 6342</td>
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<tr>
<td><strong>Course Number ( Semester B):</strong> 6343</td>
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<tr>
<td><strong>Credits ( Semester A):</strong> 5 Elective or CTE</td>
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<tr>
<td><strong>Required Prerequisite/s:</strong> None</td>
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<tr>
<td><strong>Industry Sector:</strong> Transportation</td>
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<tr>
<td><strong>Board Approval Date (Curriculum):</strong> 6/21/16</td>
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| **Course Number ( Semester B):** 6343 |  |
| **Transcript Abbreviation ( Semester B):** AUTO TECH 1 B (P) |  |
| **Credits ( Semester B):** 5 Elective or CTE |  |
| **Recommended Prerequisite/s:** None |  |
| **Career Pathway:** Systems, Diagnostics, Service and Repair |  |
| **Board Approval Date (Materials):** N/A |  |

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<thead>
<tr>
<th><strong>Core Instructional Material/s:</strong></th>
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<tr>
<th><strong>Supplemental Instructional Material/s:</strong></th>
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<tbody>
<tr>
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<tr>
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<tr>
<td>Auto Engine Performance and Drivability workbook</td>
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<tr>
<td><a href="https://www.ase.com/Home.aspx">https://www.ase.com/Home.aspx</a></td>
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<tr>
<td><a href="https://www.caljobs.ca.gov/vosnet/Default.aspx">https://www.caljobs.ca.gov/vosnet/Default.aspx</a></td>
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<tr>
<td>Teacher demonstration, video, power point and handouts</td>
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<tr>
<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>Carcarenwsservice.org</td>
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<tr>
<td>Scotty kilmer.com</td>
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<tr>
<td>Eric the car guy.com</td>
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<tr>
<td>Coolant experts.com</td>
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<tr>
<td>Cumminsfiltration.com</td>
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<td><a href="http://www.tundrasolutions.com">www.tundrasolutions.com</a></td>
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<td><a href="http://www.gm-trucks.com">www.gm-trucks.com</a></td>
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<tr>
<td><a href="http://www.obd-codes.com">www.obd-codes.com</a></td>
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<tr>
<td>Technology Resource/s:</td>
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<tr>
<td>• Various automotive technology resources as outlined in the scope and sequence document</td>
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<tr>
<td>• All Data (software)</td>
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<tr>
<td>• Mitchell On Demand (software)</td>
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<td>• ASE (software)</td>
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<td>• SP2 (software)</td>
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<td>• WorkSafe (software)</td>
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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.
Scope and Sequence Guide

The Scope and Sequence Guide is a California standards based and Career Technical Education standards based document that delineates the skills students are expected 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)
Automotive Technology I Scope and Sequence
Unit 1 - The History, Careers, Certifications, and Basic Overview of Automotive Technology
Length: 5 weeks

**Unit Description:** By understanding the history and origins of Automotive Technology, students will appreciate the rich history of Automotive Technology as a profession. Unit 1 provides students with an outline of the history of automotive technology by reviewing key historical concepts from the automotive industry. Students will review the background of the automobile, automotive careers and ASE certification criteria, basic hand tools, and basic power tools and equipment. In order to assure for the safety and well-being of students, all students will review the auto shop/classroom safety procedures associated with automotive tools and mechanics, maintenance of the shop, and general procedures and safety practices for lifting, working independently and collaboratively, and basic first aid steps in the event of accident or injury. Students will then take a safety exam as a demonstration of knowledge.

**Essential Questions:**
- How have the designs of the automobile changed from initial conception to what we have today?
- What careers are available in the automotive industry and how do certain certifications help?
- How is the automotive industry changing today?
- What are the critical safety issues required for general work within a lab-based classroom setting?
- What is the proper treatment and storage of materials and equipment?

**Unit Standards:**

**Anchor Standards Transportation; System Diagnostics, Service and Repair:**

**Communication Anchor Standards:** (Used throughout all units of study)
- Interpret verbal and nonverbal communication and respond appropriately. (2.3)
- Demonstrate elements of written and electronic communication, such as accurate spelling, grammar, and formatting. (2.4)
- Communicate information and ideas effectively to multiple audiences using a variety of media and formats. (2.5)

**Career Planning and Management:** (Used throughout all units of study)
- Research of the scope of career opportunities available and the requirements for education, training, certification, and licensure. (3.4)

**English Language Development Standards Only:**

<table>
<thead>
<tr>
<th>Learning Objectives: Students will be able to:</th>
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<tbody>
<tr>
<td>Identify and locate the most important parts of a vehicle.</td>
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<tr>
<td>Describe the purpose of the fundamental automotive systems.</td>
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<tr>
<td>Explain the interaction of automotive systems.</td>
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<tr>
<td>List the most common automotive careers.</td>
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<tr>
<td>Begin to describe the type of skills needed to be an Auto Technician.</td>
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<tr>
<td>Identify common automotive hand tools.</td>
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<tr>
<td>List safety rules for hand tools.</td>
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</table>

**Instructional Resources:**

**Core Text:**
- *Modern Automotive Technology 7th ed.* (chapters 1,2,3,4 and 5)
- Chromebook or access to computer lab (Unit 1)

**Supporting Text:**
- Modern Automotive Technology Workbook
- Auto Engine Performance and Drivability (Chapter 2, and 22)
- Auto Engine Performance and Drivability workbook

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**Instructional Resources:**

**Core Text:**
- *Modern Automotive Technology 7th ed.* (chapters 1,2,3,4 and 5)
- Chromebook or access to computer lab (Unit 1)

**Supporting Text:**
- Modern Automotive Technology Workbook
- Auto Engine Performance and Drivability (Chapter 2, and 22)
- Auto Engine Performance and Drivability workbook
• Develop a career plan that reflects career interests, pathways, and postsecondary options. (3.9)

**Technology Anchor Standards:** (Used throughout all units of study.)
- Use electronic reference materials to gather information. (4.1)
- Use information and communication technology to synthesize, compare, and contrast information from multiple sources. (4.3)
- Research past, present, and projected technological advances as they pertain to a particular pathway. (4.5)

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

**Leadership and Teamwork Anchor Standards:** (Used throughout all units of study.)
- Understand the characteristics and benefits of teamwork, leadership, and citizenship in the school, community, and workplace setting. (9.3)
- Explain how professional associations and organizations and associated leadership development and competitive

**Supplemental Resources:**
- [https://www.ase.com/Home.aspx](https://www.ase.com/Home.aspx)
- [https://www.caljobs.ca.gov/vosnet/Default.aspx](https://www.caljobs.ca.gov/vosnet/Default.aspx)
- All Data (software)
- Mitchell On Demand (software)

**Instructional Strategies:**
- Use of Literacy Routines as a strategy for access text and writing from sources.
- Essential Elements of Instruction (EEI) for lesson design and lesson planning.
<table>
<thead>
<tr>
<th>Technical Knowledge and Skills Anchor Standards: (Used throughout all units of study.)</th>
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<tbody>
<tr>
<td>- Interpret and explain terminology and practices specific to the Transportation sector. (10.1)</td>
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<thead>
<tr>
<th>Demonstration and Application Anchor Standards: (Used throughout all units of study.)</th>
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<tbody>
<tr>
<td>- 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.) (11.5)</td>
</tr>
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<thead>
<tr>
<th>Pathway Standards: Systems Diagnostics, Service, and Repair (Used throughout all units of study.)</th>
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<tbody>
<tr>
<td>- Demonstrate the practice of personal and occupational safety and protecting the environment by using materials and processes in accordance with manufacturer and industry standards. (C1.0)</td>
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<tr>
<td>- Know and understand common environmental conservation practices and their applications. (C1.1)</td>
</tr>
<tr>
<td>- 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. (C1.2)</td>
</tr>
<tr>
<td>- Understand the way in which waste gasses, emissions, and other environmentally destructive substances are generated and the effects of these substances on the environment. (C1.3)</td>
</tr>
</tbody>
</table>

- Explain how to prevent auto shop accidents.
- Use appropriate personal protective equipment and safety practices. (C1.4)
- Practice the safe and appropriate use of tools, equipment, and work processes. (C2.0)
- Recognize the importance of calibration processes, systems, and techniques using various measurements and testing devices. (C2.1)
- Demonstrate and use appropriate tools and equipment—such as wrenches, sockets, and pliers—to diagnose, service, repair, and maintain systems and components. (C2.2)
- 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). (C2.3)
- Select and use the appropriate measurement device(s) and use mathematical functions necessary to perform required fabrication, maintenance, and operation procedures. (C2.4)
- Test and analyze the elements of precisions measuring using standard and metric systems. (C2.7)

**ELA Standards:**
- Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy). (9/10.5)
- 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. (11/12.4)
- 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. (9/10.8)

<table>
<thead>
<tr>
<th>Key Unit Assignments:</th>
<th>Key Unit Assessments:</th>
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<tbody>
<tr>
<td>● Students will utilize the WWW and local resources to examine a variety of period articles on automotive design and automotive history. They will choose an illustration or famous painting of a vehicle arrangement and interpret the meaning. The students will create a chart showcasing their explanations and discoveries and present to the class and participate in a question/answer and group discussion of presentation. Students may create their presentations utilizing a Web 2.0 tool such as a PPNT or Prezi or use large chart paper.</td>
<td>● A safety procedures test - with 100% accuracy.</td>
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<tr>
<td>● Write a summary of your findings from your research of a specific time period in history. Cite sources appropriately. Consider the following characteristics of the time period in your summary: examine it for significant automotive influences over time, and create a summary writing of your findings for presentation.</td>
<td>● Peer Presentation</td>
</tr>
<tr>
<td>● Identify common safety procedures for handling containers, equipment, and maintaining safety within the lab/classroom setting and take a safety exam.</td>
<td>● Written historical automotive paper with citations</td>
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<tr>
<td>● Students will select a particular project requiring tools and then select and justify the appropriate tools for a given project.</td>
<td>● Tool Justification Project</td>
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<tr>
<td>● Set up digital or paper portfolio to keep key assignments throughout the course of study. Portfolio to be examined in final units of each semester.</td>
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Automotive Technology 1 Scope and Sequence
Unit 2 - Automotive Fundamentals
Length: 5 weeks

**Unit Description:** Powertrain – In unit 2, students will build upon the knowledge gained from unit 1 and begin to examine basic engine and transmission fundamentals. They will student and engage in hands on application of groups of components such as the engine, transmission, axles, and joins used to provide driving force to the wheels.

**Essential Questions:**
- How do the engine parts serve as a source of power for the vehicle?

**Unit Standards:**
- Anchor Standards Transportation; System Diagnostics, Service and Repair: (Use throughout all units of study)
- Pathway Standards: Systems Diagnostics, Service, and Repair (Used throughout all units of study)
  - Understand how certain tools and equipment are used to perform maintenance and repair operations. (B2.1)

**ELA Standards:**
- 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. (9/10.3)
- 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. (9/10.4)
- Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy). (9/10.5)

**English Language Development Standards Alignment:**
- English learners enrolled in this course may need assistance in the following:
  - Review of key terms and vocabulary for specific lessons.
  - Access to glossary of key terms throughout the course.
  - Guided notes.
  - Pair with a partner (EO) during group work.
  - Demonstrations of all safety features prior to practicing on equipment.
  - Oral presentations identifying key components of engine and/or transmission may be modified to account for language development & suggest providing potential questions ahead of time.

**Learning Objectives:**
- Students will be able to:
  - Identify the major parts of a typical automotive engine.
  - Describe the four-stroke cycle.
  - Define common engine terms.
  - Explain the basic functions of the major parts of an automotive engine.
  - Cite and demonstrate safe working practices related to engines.
  - Correctly answer ASE certification test questions that require knowledge of the basic operation of piston engines.
  - Describe the basic automotive engine classifications.
  - Compare gasoline and diesel engines.

**Instructional Resources:**
- **Core Text:** Modern Automotive Technology 7th ed. (chapters 11, 12, 53 and 57)
- **Supporting Text:**
  - Auto Engine Performance and Drivability
  - Modern Automotive Technology Workbook
  - Auto Engine Performance and Drivability workbook
- **Supplemental Resources:**
  - ASE (software)
  - SP2
  - WorkSafe (software)
  - Teacher demonstration, video, power point and handouts
<p>| • Discuss alternative engine types. | Instructional Strategies: (Same as Unit 1 above) |
| • List the basic parts of an automotive clutch. |  |
| • Explain the operation of a clutch. |  |
| • Describe the construction of major clutch components. |  |
| • Compare clutch design differences. |  |
| • Explain the different types of clutch release mechanisms. |  |
| • Identify the basic components of an automotive transmission. |  |
| • Describe the function and operation of the major parts of an automatic transmission. |  |
| • Trace the flow of power through an automatic transmission. |  |
| • Explain how an automatic transmission shifts gears. |  |
| • Compare the different types of automatic transmissions. |  |</p>
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<tr>
<th>Key Unit Assignments:</th>
<th>Key Unit Assessments:</th>
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<tbody>
<tr>
<td>● Working in groups, as well as individually, students will correctly explain and</td>
<td>• Safety skills test with 100% accuracy for equipment</td>
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<tr>
<td>illustrate the flow of motion, locate and identify drive train components, and</td>
<td>utilized in Unit 2.</td>
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<tr>
<td>correctly identify and perform maintenance and service on a standards and an</td>
<td>• Identification skills tests on basic engine and</td>
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<tr>
<td>automatic transmission</td>
<td>transmission components.</td>
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<tr>
<td>● Utilizing key reference materials from the classroom instruction, students will</td>
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<tr>
<td>identify and perform basic maintenance and service on standard and automatic</td>
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<td>transmissions/transaxles.</td>
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<tr>
<td>● Utilizing key reference materials from the classroom instruction, students will</td>
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<td>both individually and collaboratively correctly identify gasoline and diesel, two</td>
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<td>and four stroke cycle engines.</td>
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<tr>
<td>● Utilizing key reference materials from the classroom instruction, students will</td>
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<tr>
<td>both individually and collaboratively correctly identify cylinder arrangement.</td>
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### Unit Description:
In unit 3, students will begin to diagnose and provide preventative maintenance to vehicles – including basic service for vehicle operation conditions. Vehicle maintenance includes any operation that will keep the vehicle in good operation condition. Students will examine a variety of service manuals for more detailed information. Upon diagnoses, students will demonstrate proper techniques for preventative maintenance.

### Essential Question:
- What are the fundamental vehicle maintenance requirements in order to keep the vehicle in safe operating standards?

### Learning Objectives:
- Check a car’s fluid levels.
- Explain the importance of vehicle maintenance.
- Locate fluid leaks.
- Replace engine oil and filter.
- Change automatic transmission fluid and filter.
- Perform a grease job.
- Inspect for general problems with hoses, belts, and other equipment.
- Utilize reference materials for preventative maintenance and automotive specifications.
- Correctly diagnose and perform preventive maintenance on drive belts.

### Instructional Resources:
- **Core Text:**
  - Modern Automotive Technology 7th ed. (chapter 10)
- **Supporting Text:**
  - Modern Automotive Technology Workbook
- **Supplemental Resources:**
  - ASE
  - All Data
  - Mitchell On Demand
  - Cars.com
  - Tech News Today
  - Popular Mechanics
  - Carcarenewsservice.org
  - Scottykilmer.com
  - Ericthecarguy.com

### Instructional Strategies:
(Same as Unit 1 above)
- Construct projects and products specific to the Transportation sector requirements and expectations. (10.3)
- Collaborate with the industry experts for specific technical knowledge and skills. (10.4)

**Pathway Standards: Systems Diagnostics, Service, and Repair**
(Used throughout all units of study.)
- Demonstrate how to access technical reports, manuals, electronic retrieval systems, and related technical data resources. (C2.6)
- Perform and document maintenance procedures in accordance with the recommendations of the manufacturer. (C4.0)
- Communicate the procedures and practices of various manufacturers regarding service, repair, and maintenance schedules. (C4.1)
- Demonstrate how to properly document maintenance and repair procedures in accordance with applicable rules, laws, and regulations (e.g., Bureau of Automotive repair [BAR], Occupational safety and Health Administration [OSHA], and the California Air Resources Board [ARB]). (C4.2)
- Use references 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. (C4.3)
- Complete a work order, including customer information, description of repairs, and billing information, in accordance with applicable rules, laws, and regulations. (C4.4)

**ELA Standards:**
- Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or

- Correctly diagnose and perform preventive maintenance on tires.
- Correctly diagnose and determine proper operation of windshield wipers and washers.
performing technical tasks, attending to special cases or exceptions defined in the text. (9/10.3)
- 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 9-10 texts and topics. (9/10.4)
- Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy). (9/10.5)

**Writing Standards:**
- 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. (9/10.8)
- Draw evidence from text to support analysis, reflection and research. (9/10.9)

**Key Unit Assignments:**
On a vehicle chosen by your instructor, correctly diagnose and provide preventative maintenance for the following:
- Determine condition of drive belts
- Identify belt type and routing
- Belt replacement
- Determine proper fluid levels
- Identify filter types and application
- Identify proper tire usage
- Tire repair
- Wheel balance
- Tire rotation
- Tire dismount and mount
- Tire pressure

**Key Unit Assessments:**
- Complete the review quiz for Chapter 10
- Demonstration skills test on diagnosis and preventative maintenance
- 1-page reflection of diagnosis and preventative maintenance skills.
- Tire safety
- Identification and application of wheel bearing
- Removal and installation of wheel bearings
- Inspection and packing of wheel bearings
- Mechanical listening skills to identify and diagnose source of noise
- Determine proper washer fluid
- Determine proper operation of wipers and washers

Upon completion of the demonstration, students will write a one-page summary reflection of their demonstration, including those areas where they are in need of improvement and what they could have done differently to address the problem.
Automotive Technology 1 Scope and Sequence  
Unit 4 - Vehicle Maintenance  
Length: 1 week

**Unit Description:** In unit 4, students will examine automotive lubrication systems. They will examine lubrication properties, ratings and functions, and perform lubrication service and filter maintenance.

**Essential Questions:**
- What are the functions of a lubrication system?
- Why is it important to correctly identify and lubricate key engine and automotive parts?

**Unit Standards:**

**Anchor Standards Transportation; System Diagnostics, Service and Repair:** (Use throughout all units of study)

**Pathway Standards: Systems Diagnostics, Service, and Repair** (Used throughout all units of study)
- Use scientific principles in relation to chemical, mechanical, and physical functions for various engine and vehicle systems. (C3.0)
- Explain the principles of converting energy from one form to another. (C3.6)
- Demonstrate the application, operation, maintenance, and diagnosis of engines, including but not limited to two- and four-stroke and supporting subsystems. (C6.0)
- Perform general engine maintenance, diagnosis, service, and repair in accordance with portable national industry standards, such as the National Automotive Technicians Education Foundation and the Equipment and Engine Training Council. (C6.1)
- Maintain, diagnose, service, and repair lubrication and cooling systems. (C6.2)

**ELA Standards:**
- Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or

**English Language Development Standards Alignment:**

**Learning Objectives:**

**Students will be able to:**
- List the basic parts of a lubrication system.
- Summarize the operation of a lubrication system.
- Describe the construction of lubrication system parts.
- Compare different lubrication system designs.
- Explain the characteristics and ratings of engine oil.
- Discuss safety procedures that should be followed when working with the lubrication system.

**Instructional Resources:**

**Core Text:**
- *Modern Automotive Technology* 7th ed. (chapter 41)

**Supporting Text:**
- Modern Automotive Technology Workbook
- Auto Engine Performance and Drivability (Chapter 5 and 19)
- Auto Engine Performance and Drivability workbook

**Supplemental Resources:**
- ASE
- All Data
- Mitchell On Demand

**Instructional Strategies:**
(See Unit 1 above)
performing technical tasks, attending to special cases or exceptions defined in the text. (9/10.3)
- Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy). (9/10.5)
- 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 11-12 texts and topics. (11/12.4)

**Writing Standards:**
- 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. (9/10.8)
- Draw evidence from literary or informational texts to support analysis, reflection, and research. (9/10.9)

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

**Key Unit Assignments:**
- Students will work in groups and individually and determine the proper lubricants for various applications. They will change engine oil, understand and demonstrate how to read the engine oil dipsticks, perform chassis and car body lubrication practices, and perform oil filter maintenance.

**Key Unit Assessments:**
- Demonstration skills test on proper lubricant application and maintenance
- 1-page reflection of diagnosis and preventative maintenance skills.
# Automotive Technology 1

## Scope and Sequence

### Unit 5 - Cooling Systems

**Length:** 2 weeks

| Unit Description: | In unit 5, students will read and perform basic operation, construction, diagnosis, and repair of the modern cooling system. The cooling and lubrication systems are designed to prevent engine damage and wear. |
| Essential Questions: |  ● What are the safety procedures to follow when working with cooling systems?  
● Why is it important to keep the cooling and lubrication systems in good working order? |
| Unit Standards: | **Anchor Standards Transportation; System Diagnostics, Service and Repair:** (Use throughout all units of study)  
- Maintain a safe and healthful working environment. (6.6)  
- Be informed of laws/acts pertaining to the occupational safety and health administration (OSHA). (6.7)  
- Utilize work-based/workplace learning experiences to demonstrate and expand upon knowledge and skills gained during classroom instruction and laboratory practices specific to the Transportation sector program of study. (11.1)  

**Pathway Standards: Systems Diagnostics, Service, and Repair** (Used throughout all units of study.)  
- Extract information from Material Safety Data Sheets (MSDS) pertaining to chemicals used in the workplace. (A6.1)  
- Adhere to ergonomic and environmental safety regulations in the workplace. (A6.4)  
- Determine the safe and correct application and use for chemicals used in the transportation industry. (A6.6)  
- Use tools, equipment, and machines to safely measure, test, diagnose, and analyze components and systems (e.g., electrical and electronic circuits, alternating – and direct-|
| English Language Development Standards Alignment: | English learners enrolled in this course may need assistance in the following:  
- Review of key terms and vocabulary for specific lessons.  
- Access to glossary of key terms throughout the course.  
- Guided notes.  
- Pair with a partner (EO) during group work.  
- Demonstrations of all safety features prior to practicing on equipment.  
- When completing the diagnosis and preventative maintenance assignment, consider grouping students in groups of two or three.  

| Learning Objectives: | Students will be able to:  
- Summarize the functions of a cooling system.  
- Explain the operation and construction of major cooling system components.  
- Compare cooling system design variations.  
- Explain the importance of antifreeze.  
- Discuss safety procedures to follow when working with cooling systems.  
- List the most common causes of system leakage, overheating, and overcooling.  
- Perform a combustion leak test and a system pressure test.  
- Check the major parts of a cooling system for proper operation.  
- Replace faulty cooling system components.  

| Instructional Resources: | Core Text:  
- Modern Automotive Technology 7th ed. (chapter 39 and 40)  

**Supporting Text:**  
- Modern Automotive Technology Workbook  

**Supplemental Resources:**  
- ASE  
- All Data  
- Mitchell On Demand  
- Cars.com  
- Tech News Today  
- Popular Mechanics  
- Carcarenewsservice.org  
- Coolant experts.com  
- Cumminsfiltration.com  

**Instructional Strategies:** (See unit 1 above) |
| current applications, fluid/hydraulic and air/pneumatic systems. (B2.2)  | • Drain, flush, and refill a cooling system. |
| • Use industry-standard measurement scales, devices, and systems to perform design, fabrication, diagnostic, maintenance, and repair procedures. (B3.1)  | |
| • Identify and understand the physical and chemical characteristics of metals, plastics, and other materials. (B4.1)  | |
| • Describe the basic terms, characteristics, and concepts of physical and chemical processes. (B4.2)  | |
| • Perform heating, air-conditioning, and cooling system repairs. (B8.5)  | |
| • Describe the operating principles of internal and/or external combustion engines. (C3.1)  | |
| • Perform necessary procedures to maintain, diagnose, service, and repair vehicle systems and malfunctions. (C3.7)  | |

**ELA Standards:**
- 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. (9/10.3)
- Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy). (9/10.5)
- Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. (9/10.7)

**Writing Standards:**
- 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. (9/10.8)
• Draw evidence from literary or informational texts to support analysis, reflection, and research. (9/10.9)

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

**Key Unit Assignments:**
• After conducting research on the WWW and/or through use of in class resource materials, students will write a 1-page essay explaining how the selection of coolant effects the proper functioning of a vehicle.
• Students will both individually and collaboratively correctly perform a combustion system pressure test through both a visual demonstration and hands on practice.
• Students will run a boiling temperature and freezing temperature test on coolant.
• Students will test the validity of existing coolant.

**Key Unit Assessments:**
• Essay on cooling effects and functions
• Skills tests on cooling systems
Automotive Technology 1 Scope and Sequence  
Unit 6 - Induction and Exhaust Systems  
Length: 4 weeks

**Unit Description:** In unit 6, students will be introduced to Automotive fuels, gasoline and diesel combustion; fuel tanks, lines, pumps and filters; gasoline fuel injection fundamentals; carburetor operation and service; induction, exhaust, including turbochargers and superchargers, and emission control systems. Students will examine and describe the basic parts of an exhaust system, including a study of the theory and repair of exhaust systems.

**Essential Questions:**
- Why are there different fuels?
- How can students prove the focus of alternative fuels upon the environment as they pertain to the automotive industry?
- What is the reason for the emission controls?

**Unit Standards:**

- **Anchor Standards Transportation; System Diagnostics, Service and Repair:** (Use throughout all units of study)
  - Explore issues of global significance and document the impact on the Transportation sector. (7.8)
  - Identify local, district, state, and federal regulatory agencies, entities, laws, and regulations related to the Transportation industry sector. (8.2)
  - Demonstrate ethical and legal practices consistent with Transportation sector workplace standards. (8.3)

- **Pathway Standards: Systems Diagnostics, Service, and Repair** (Used throughout all units of study.)
  - Describe hazardous and nonhazardous materials handling. (A3.3)
  - Determine the effects of government regulations on stock handling techniques and warehousing. (A3.6)
  - Identify the legal aspects of sales contracts and warranties.
  - Identify environmental conditions that would impact various aspects of the transportation industry. (A4.5)
  - Conform to federal, state, and local regulations and manufacturer’s specifications when handling, storing, and disposing of chemicals and equipment, including necessary certifications. (A6.3)

**English Language Development Standards Alignment:**

English learners enrolled in this course may need assistance in the following:
- Review of key terms and vocabulary for specific lessons.
- Access to glossary of key terms throughout the course.
- Guided notes.
- Pair with a partner (EO) during group work.
- Demonstrations of all safety features prior to practicing on equipment.
- When completing the diagnosis and preventative maintenance assignment, consider grouping students in groups of two or three.

**Learning Objectives:**

Students will be able to:
- Inspect and test carburetor circuits. Students will identify, tests and services various components of the system.
- Inspect and tests fuel pressure regulation systems and components of injection type fuel systems; adjust or replace as needed.
- Identify proper fuel usage: gasoline vs. diesel.
- Identify throttle body (TBI) and port fuel injection systems.
- Understand induction and exhaust systems including turbochargers and superchargers.
- Describe the basic parts of an exhaust system.

**Instructional Resources:**

**Core Text:**
- *Modern Automotive Technology* 7th ed. (chapter 27)

**Supporting Text:**
- Modern Automotive Technology Workbook

**Supplemental Resources:**
- ASE
- All Data
- Mitchell On Demand
- Cars.com
- Tech News Today
- Popular Mechanics
- Carcarenewservice.org
- Scotty kilmer.com
- Eric the car guy.com

**Instructional Strategies:**
(see Unit 1 above)
| Adhere to ergonomic and environmental safety regulations in the workplace. (A6.4) | Perform exhaust system repairs. |
| Determine the safe and correct application and use for chemicals used in the transportation industry. (A6.6) | Explain the fundamental parts of a turbo charging system. |
| Define fueling infrastructure needed to move vehicles, equipment, goods, and services from one location to another. (A7.3) | Describe the construction and operation of a supercharging system. |
| Evaluate the need to safely move fluids from one location to another. (A7.5) | Demonstrate an understanding of safety procedures for working on exhaust systems, turbochargers, and superchargers. |

**ELA Standards:**

- 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. (9/10.3)
- Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy). (9/10.5)
- 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 11-12 texts and topics. (11/12.4)

**Writing Standards:**

- 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. (9/10.8)
- Draw evidence from literary or informational texts to support analysis, reflection, and research. (9/10.9)
<table>
<thead>
<tr>
<th>Math Standards:</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Apply concepts of density based on area and volume in modeling situations. (G-MG2)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Key Unit Assignments:</th>
</tr>
</thead>
<tbody>
<tr>
<td>● Students will both individually and collaboratively correctly identify one, two, and four barrel carburetors through both a visual demonstration and hands on practice.</td>
</tr>
<tr>
<td>● Students will both individually and collaboratively correctly identify fuel storage tanks. Students will inspect and replace fuel lines as needed and remove and replace system components.</td>
</tr>
<tr>
<td>● Students will both individually and collaboratively correctly complete a mile per gallon (MPG) study.</td>
</tr>
<tr>
<td>● Students will both individually and collaboratively correctly identify under hood fuel injection systems.</td>
</tr>
<tr>
<td>● Students will both individually and collaboratively correctly identify induction and exhaust system design differences. Students will perform exhaust system repairs and demonstrate an understanding of safety procedures for working on exhaust systems, turbochargers and superchargers.</td>
</tr>
<tr>
<td>● Through a hands-on activity, students will diagnose hot or cold no-starting, hard starting, poor drive ability, incorrect idle speed, poor idle, flooding, hesitation, surging, engine misfire, power loss, stalling, poor mileage, and dieseling and emissions problems; determine necessary action.</td>
</tr>
<tr>
<td>● Check fuel for contaminants and quality; determine necessary action.</td>
</tr>
<tr>
<td>● Inspect and test fuel pumps and pump control systems for pressure, regulation, and volume; perform necessary action.</td>
</tr>
<tr>
<td>● Replace fuel filters.</td>
</tr>
<tr>
<td>● Inspect throttle body, air induction system, intake manifold and gaskets for vacuum leaks and/or unmetered air.</td>
</tr>
<tr>
<td>● Inspect and test fuel injectors.</td>
</tr>
<tr>
<td>● Verify idle control operation.</td>
</tr>
<tr>
<td>● Inspect the integrity of the exhaust pipes, muffler(s), catalytic converter(s), resonator (s), tail pipe(s), and heat shields, perform necessary action.</td>
</tr>
<tr>
<td>● Perform exhaust system backpressure test; determine necessary action.</td>
</tr>
<tr>
<td>● Test the operation of turbocharger/supercharger systems; determine necessary action.</td>
</tr>
<tr>
<td>● Diagnose oil leaks, emissions and drive ability concerns caused by the positive crankcase ventilation (PCV) system; determine necessary action.</td>
</tr>
<tr>
<td>● Inspect, test, and service positive crankcase ventilation system (PCV) filter/breather cap, valve, tubes, orifices, and hoses; perform necessary action.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Key Unit Assessments:</th>
</tr>
</thead>
<tbody>
<tr>
<td>● Complete Skills Tests</td>
</tr>
</tbody>
</table>
- Inspect, test, service, and replace components of the exhaust gas recirculation (EGR) system, including EGR tubing, exhaust passages, vacuum/pressure controls, filters and hoses; perform necessary action.
- Inspect and test electrical/electronic sensors, controls, and wiring, of exhaust gas recirculation (EGR) systems; perform necessary action.
- Diagnose emissions and drive ability concerns caused by the secondary air injection and catalytic converter systems; determine necessary action.
- Inspect and test mechanical components of secondary air injection systems; perform necessary action.
- Inspect and test electrical/electronically-operated components and circuits of air injection systems; perform necessary action.
- Inspect and test catalytic converter efficiency.
- Diagnose emissions and drivability concerns caused by the evaporative (EVAP) emissions control system; determine necessary action.
- Inspect and test components and hoses of the evaporative emissions control system; perform necessary action.
Automotive Technology 1 Scope and Sequence
Unit 7 - Induction and Exhaust Systems
Length: 9 weeks

Unit Description: In unit 7, students will spend nine weeks examining suspension system fundamentals, steering system fundamentals, and brake system fundamentals. Students will read, research, and apply their learning to various tasks within the shop. They will keep guided notes on the functions and major parts of each system, demonstrate and describe various systems, and participate in a question/answer discussion designed to enhance understanding and application of learning.

Essential Questions:
- What are the major functions of steering, suspension, and brake systems?

Unit Standards:

Anchor Standards Transportation; System Diagnostics, Service and Repair: (Use throughout all units of study)
- Recognize how financial management impacts the economy, workforce and community. (7.1)

Pathway Standards: Systems Diagnostics, Service, and Repair (Used throughout all units of study.)
- Recognize the importance of space and location of equipment. (A1.1)
- Identify where to place equipment for effective and efficient processing. (A1.3)
- Demonstrate the safety practices applied when servicing vehicle-body electronics and other vehicle systems. (B1.6)

ELA Standards:
- 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. (9/10.3)
- Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy). (9/10.5)

English Language Development Standards Alignment:
English learners enrolled in this course may need assistance in the following:
- Review of key terms and vocabulary for specific lessons.
- Access to glossary of key terms throughout the course.
- Guided notes.
- Pair with a partner (EO) during group work.
- Demonstrations of all safety features prior to practicing on equipment.
- When completing the diagnosis and preventative maintenance assignment, consider grouping students in groups of two or three.

Learning Objectives:
Students will be able to:
- Compare and contrast, drum brakes and disc brakes.
- Describe the operation of parking brakes.
- Explain the operation of power brakes.
- Describe basic procedures for servicing a master cylinder and brake booster.
- Explain how to service a drum brake assembly and a disc brake assembly.
- Site the safety rules to be followed in servicing brake systems.
- Describe the purpose and operation of traction control and stability control systems.
- Compare anti-lock brake design variations.
- Describe methods of tire construction.

Instructional Resources:
Core Text:
- Modern Automotive Technology 7th ed. (chapters 65, 66, 67, 69, 71 & 74)

Supporting Text:
- Auto Engine Performance and Drivability (chapter 20)
- Modern Automotive Technology Workbook

Supplemental Resources:
- ASE
- All Data
- Mitchell On Demand
- Cars.com
- Tech News Today
- Popular Mechanics
- Carecarenwservice.org
- Scotty kilmer.com
- Eric the car guy.com
Writing Standards:
- 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. (9/10.8)
- Draw evidence from literary or informational texts to support analysis, reflection, and research. (9/10.9)

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

Instructional Strategies:
- www.tundrasolutions.com
- www.gm-trucks.com
- www.obd-codes.com

Instructional Strategies:
(see unit 1 above)
<table>
<thead>
<tr>
<th>Explain the principles of wheel alignment.</th>
<th>List the purpose of each wheel alignment setting.</th>
<th>Describe the six characteristics of wheel alignment.</th>
</tr>
</thead>
<tbody>
<tr>
<td>List the purpose of each wheel alignment setting.</td>
<td>Describe the use of different types of wheel alignment equipment.</td>
<td></td>
</tr>
</tbody>
</table>

**Key Unit Assignments:**
- Examine the activities at the end of each of the identified chapters in this unit and complete at least 2 of the 4 activities outlined at the end of the chapter and submit.
- Working with a partner, students will analyze and compare tire sidewall data key points for discussion. Identify and record the sidewall data on a tire. Students will create a chart that shows the information. They will include columns in the chart to show average price for each type and size and present their findings.
- In small groups students will prepare discussion questions on the unit and break into small groups and discuss and then present their information to others.

**Key Unit Assessments:**
- End of unit activities
- Data record and information chart
- Discussion rubric evaluation
## Unit 8 - Automotive Electrical Systems

### Length: 6 weeks

| Unit Description: | In unit 8, students will examine the fundamentals of automotive batteries, starting systems, charging systems, ignition and lighting systems. They will be expected to explain the various operating principles, understand the primary functions of the system, and explain the construction of the various systems. |
| Essential Questions: | - What are the key operating functions of the electrical components of an automotive system?  
- What are the key operational diagnostic, and repair details of automotive electrical systems? |
| Unit Standards: | **Anchor Standards Transportation; System Diagnostics, Service and Repair:** (Use throughout all units of study)  
**Pathway Standards: Systems Diagnostics, Service, and Repair** (Used throughout all units of study.)  
**ELA Standards:**  
- 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. (9/10.3)  
- Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy). (9/10.5)  
**Writing Standards:**  
- 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. (9/10.8)  
- Draw evidence from literary or informational texts to support analysis, reflection, and research. (9/10.9)  
| English Language Development Standards Alignment: |  
English learners enrolled in this course may need assistance in the following:  
- Review of key terms and vocabulary for specific lessons.  
- Access to glossary of key terms throughout the course.  
- Guided notes.  
- Pair with a partner (EO) during group work.  
- Demonstrations of all safety features prior to practicing on equipment.  
- When completing the diagnosis and preventative maintenance assignment, consider grouping students in groups of two or three. |
| Learning Objectives: | Students will be able to:  
- Explain the operating principles of an automotive ignition system.  
- Describe the function of major ignition system components.  
- Outline and correctly identify tune up procedures and protocol.  
- Identify and sketch the primary and secondary sections of the ignition system.  
- Identify and perform cleaning, gap, removal and installation procedures.  
- Identify and list the basic parts of a charging system.  
- Identify and verify charging rates with digital multimeter. |
| Instructional Resources: |  
**Core Text:**  
- *Modern Automotive Technology* 7th ed.  
(chapters 28, 29, 30, 32, 34, and 36)  
**Supporting Text:**  
- Auto Engine Performance and Drivability (chapter 8)  
- Modern Automotive Technology Workbook  
**Supplemental Resources:**  
- ASE  
- All Data  
- Mitchell On Demand  
- Cars.com  
- Tech News Today  
- Popular Mechanics  
- Carecarenewsservice.org  
- Scotty kilmer.com  
- Eric the car guy.com  
- [www.tundrasolutions.com](http://www.tundrasolutions.com)
| Math Standards: Apply concepts of density based on area and volume in modeling situations. (G-MG2) | • Identify and inspect major charging system components including:
  - Starting system principles.
  - Starting system components.
  - Starting system testing
• Identify and describe the construction and operation of a starter motor.
  - Battery principles.
  - Battery functions.
  - Battery construction.
  - Battery types.
  - Battery ratings.
  - Battery maintenance.
• Correctly identify and explain the operating principles of a lead acid battery.
• Correctly identify and sketch the basic parts of an automotive battery.
• Correctly identify and check battery function.
• Correctly identify and define industry standards for battery ratings.
• Correctly identify and describe battery maintenance procedures. | Instructional Strategies:
*See Unit 1 above]* | www.gm-trucks.com
www.obd-codes.com |
### Key Unit Assignments:
- Check Open Circuit Voltage
- Check Ohmic value of light bulbs, switches, wires, and relays
- Draw a series circuit
- Draw a parallel circuit
- Perform a voltage drop test
- Measure and set proper air gap on spark plugs
- Complete career portfolio with capstone assignments and reflection pieces – discuss this with the teacher

### Key Unit Assignments:
- Effective business test (key components)
- Portfolio