Automotive 3

Unit Title: **Unit 1: Shop and Machine Safety Review**

Stage 1: Desired Results

Standards & Indicators:

9.3.12.TD-MTN.1 Develop preventative maintenance plans and systems to keep facility and equipment inventory in operation.

9.3.12.TD-HSE.1 Describe the health, safety and environmental rules and regulations in transportation, distribution and logistics workplaces.

9.3.12.TD-HSE.2 Develop solutions to improve performance of health, safety and environmental management services.

Career Readiness, Life Literacies and Key Skills

Standard	Performance Expectations	Core Ideas
9.4.12.CI.1	Demonstrate the ability to reflect, analyze, and use creative skills and ideas.	With a growth mindset, failure is an important part of success.
9.4.12.CI.3	Investigate new challenges and opportunities for personal growth, advancement, and transition.	Innovative ideas or innovation can lead to career opportunities.
9.4.12.IML.3	Analyze data using tools and models to make valid and reliable claims, or to determine optimal design solutions.	Digital tools such as artificial intelligence, image enhancement and analysis, and sophisticated computer modeling and simulation create new types of information that may have profound effects on society. These new types of information must be evaluated carefully.
9.4.12.IML.4	Assess and critique the appropriateness and impact of existing data visualizations for an intended audience	
9.4.12.TL.4:	Collaborate in online learning communities or social networks or virtual worlds to analyze and propose a resolution to a real-world problem.	Collaborative digital tools can be used to access, record and share different viewpoints and to collect and tabulate the views of groups of people.
9.2.12.CAP.3	Investigate how continuing education contributes to one's career and personal growth	There are strategies to improve one's professional value and marketability.
9.2.12.CAP.4	Evaluate different careers and develop various plans (e.g., costs of public, private, training schools) and timetables for achieving them, including educational/training requirements, costs, loans, and debt repayment.	Career planning requires purposeful planning based on research, self-knowledge, and informed choices.
9.2.12.CAP.6	Identify transferable skills in career choices and design alternative career plans based on those skills.	

Central Idea/Enduring Understanding:

Students will understand that…

The machines must be used properly or injury may occur.

A clean workspace can prevent many injuries from occurring in the first place.

Essential/Guiding Question:

- What hazards are associated with each machine found in the shop?
- What proactive measures do we take to prevent injury?
- Where is the safety equipment located in the shop and how do we operate it?

Content:

- Machine Safety
- Machine Operation

Skills(Objectives):

Students will be able to…

- Safely operate all machines

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• Hand Tools • Hand Tool Safety • Chemical Safety • Chemical Use • Fire Suppression • Locations of all safety equipment in the classroom • Power Tools • Power Tool Safety • Air Tools • Air Tool Safety	• Safely use all hand tools • Safely use and handle chemicals • Safely use all power tools • Safely use all air tools • Properly use all fire suppression equipment • Identify hazards in the shop

Interdisciplinary Connections

NJSLSA.R7: Integrate and evaluate content presented in diverse media and formats, including visually and quantitatively, as well as in words.
RST.9-10.7: Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.
WHST.9-12.1: Write arguments focused on discipline-specific content.
HS-ETS1-3: Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts.
8.1.12.DA.1: Create interactive data visualizations using software tools to help others better understand real world phenomena, including climate change.
8.1.12.DA.6: Create and refine computational models to better represent the relationships among different elements of data collected from a phenomenon or process.
8.1.12.AP.5: Decompose problems into smaller components through systematic analysis, using constructs such as procedures, modules, and/or objects.
8.2.2.EC.1: Identify and compare technology used in different schools, communities, regions, and parts of the world.
RL.11-12.1 Cite strong and thorough textual evidence and make relevant connections to support analysis of what the text says explicitly as well as inferences drawn from the text, including determining where the text leaves matters uncertain.
RL.9-10.2 Determine a theme or central idea of a text and analyze in detail its development over the course of the text, including how it emerges and is shaped and refined by specific details and provide an objective summary of the text.
RST.11-12.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.
RST.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 11-12 texts and topics.
RST.11-12.10 By the end of grade 12, read and comprehend science/technical texts in the grades 11-CCR text complexity band independently and proficiently
CED.A.4 Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. For example, rearrange Ohm's law V = IR to highlight resistance R.
REI.A.1 Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method.

Stage 2: Assessment Evidence

Performance Task(s): Chapter/Unit Test Presentations/Projects Practical Demonstration Unit Exams	**Other Evidence:** • Do Now • Concept Map • Notebook

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Stage 3: Learning Plan

Learning Opportunities/Strategies:	Resources:
• Observation • Homework • Class participation • Writing Assignments • Do Now • Notebook • Hands on Demonstrations	• Shop Safety Equipment • Fire Extinguisher Information Sheet • Fire Evacuation Review • Shop Tools • Automotive Technology textbook Goodheart-Wilcox Publisher, Auto Fundamentals 13th Edition

Differentiation *Please note: Teachers who have students with 504 plans that require curricular accommodations are to refer to Struggling and/or Special Needs Section for differentiation

High-Achieving Students	On Grade Level Students	Struggling Students	Special Needs/ELL
Teacher tutoring Peer tutoring Cooperative learning groups Differentiated instruction Extra credit assignments for faster paced students	Teacher tutoring Peer tutoring Cooperative learning groups Differentiated instruction Pair students with a partner if needed	Teacher tutoring Peer tutoring Cooperative learning groups Differentiated instruction Response to Intervention (RTI) www.help4teachers.com (search tiered lesson plan template) Pair students with a partner if needed Pacing deadlines for slower paced students	Any student requiring further accommodations and/or modifications will have them individually listed in their 504 Plan or IEP. These might include, but are not limited to: breaking assignments into smaller tasks, giving directions through several channels (auditory, visual, kinesthetic, model), and/or small group instruction for reading/writing ELL supports should include, but are not limited to, the following:: Extended time Provide visual aids Repeated directions Differentiate based on proficiency Provide word banks Allow for translators, dictionaries

Unit Title: **Unit 2: Electronics and Electrical Systems**

Stage 1: Desired Results

Standards & Indicators:

9.3.12.TD-MTN.1 Develop preventative maintenance plans and systems to keep facility and equipment inventory in operation.

9.3.12.TD-HSE.1 Describe the health, safety and environmental rules and regulations in transportation, distribution and logistics workplaces.

9.3.12.TD-HSE.2 Develop solutions to improve performance of health, safety and environmental management services.

Career Readiness, Life Literacies and Key Skills

Standard	Performance Expectations	Core Ideas
9.4.12.CI.1	Demonstrate the ability to reflect, analyze, and use creative skills and ideas.	With a growth mindset, failure is an important part of success.

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9.4.12.CI.3	Investigate new challenges and opportunities for personal growth, advancement, and transition.	Innovative ideas or innovation can lead to career opportunities.
9.4.12.IML.3	Analyze data using tools and models to make valid and reliable claims, or to determine optimal design solutions.	Digital tools such as artificial intelligence, image enhancement and analysis, and sophisticated computer modeling and simulation create new types of information that may have profound effects on society. These new types of information must be evaluated carefully.
9.4.12.IML.4	Assess and critique the appropriateness and impact of existing data visualizations for an intended audience	
9.4.12.TL.4	Collaborate in online learning communities or social networks or virtual worlds to analyze and propose a resolution to a real-world problem.	Collaborative digital tools can be used to access, record and share different viewpoints and to collect and tabulate the views of groups of people.
9.2.12.CAP.3	Investigate how continuing education contributes to one's career and personal growth	There are strategies to improve one's professional value and marketability.
9.2.12.CAP.4	Evaluate different careers and develop various plans (e.g., costs of public, private, training schools) and timetables for achieving them, including educational/training requirements, costs, loans, and debt repayment.	Career planning requires purposeful planning based on research, self-knowledge, and informed choices.
9.2.12.CAP.6	Identify transferable skills in career choices and design alternative career plans based on those skills.	

Central Idea/Enduring Understanding:
Students will understand that…
- Dealing with electricity can be dangerous and care must be taken at all times.
- Electrical components are sensitive and should only be used for what they were intended for.

Essential/Guiding Question:
- What makes a complex circuit?
- What are the components of a printed circuit board?
- What precautions should be taken when working with electronics?

Content:
- Electricity Flow
- Diode Function
- Resistor Function
- Capacitor Function
- Hall Effect Switches
- Relays & Solenoids
- Wire Gauges
- PCB Design
- PROM's

Skills(Objectives):
Students will be able to…
- Trace out electrical circuits
- Read resistors
- Read wiring schematics
- Safely test electrical components
- Properly repair electrical circuits

Interdisciplinary Connections
NJSLSA.R7: Integrate and evaluate content presented in diverse media and formats, including visually and quantitatively, as well as in words.
RST.9-10.7: Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.
WHST.9-12.1: Write arguments focused on discipline-specific content.
HS-ETS1-3: Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts.

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8.1.12.DA.1: Create interactive data visualizations using software tools to help others better understand real world phenomena, including climate change.
8.1.12.DA.6: Create and refine computational models to better represent the relationships among different elements of data collected from a phenomenon or process.
8.1.12.AP.5: Decompose problems into smaller components through systematic analysis, using constructs such as procedures, modules, and/or objects.
8.2.2.EC.1: Identify and compare technology used in different schools, communities, regions, and parts of the world.
RL.11-12.1 Cite strong and thorough textual evidence and make relevant connections to support analysis of what the text says explicitly as well as inferences drawn from the text, including determining where the text leaves matters uncertain.
RL.9-10.2 Determine a theme or central idea of a text and analyze in detail its development over the course of the text, including how it emerges and is shaped and refined by specific details and provide an objective summary of the text.
RST.11-12.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.
RST.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 11-12 texts and topics.
RST.11-12.10 By the end of grade 12, read and comprehend science/technical texts in the grades 11-CCR text complexity band independently and proficiently
CED.A.4 Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. For example, rearrange Ohm's law V = IR to highlight resistance R.
REI.A.1 Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method.

Stage 2: Assessment Evidence

Performance Task(s):	Other Evidence:
Chapter/Unit Test Presentations/Projects Practical Demonstration Unit Exams	• Do Now • Concept Map • Notebook

Stage 3: Learning Plan

Learning Opportunities/Strategies:	Resources:
• Observation • Homework • Class participation • Writing Assignments • Do Now • Notebook • Hands on Demonstrations	• DVOM • Printed Circuit Boards • Wires and Test Leads • Shop Tools • Electrical Components • Shop vehicle(s) • Automotive Technology textbook Goodheart-WilcoxPublisher, Auto Fundamentals 13th Edition

Differentiation *Please note: Teachers who have students with 504 plans that require curricular accommodations are to refer to Struggling and/or Special Needs Section for differentiation

High-Achieving Students	On Grade Level Students	Struggling Students	Special Needs/ELL
Teacher tutoring Peer tutoring Cooperative learning groups Differentiated instruction Extra credit assignments for faster paced students	Teacher tutoring Peer tutoring Cooperative learning groups Differentiated instruction	Teacher tutoring Peer tutoring Cooperative learning groups Differentiated instruction Response to Intervention (RTI)	Any student requiring further accommodations and/or modifications will have them individually listed in their 504 Plan or IEP. These might include, but are not limited to: breaking assignments into smaller

	Pair students with a partner if needed	www.help4teachers.com (search tiered lesson plan template) Pair students with a partner if needed Pacing deadlines for slower paced students	tasks, giving directions through several channels (auditory, visual, kinesthetic, model), and/or small group instruction for reading/writing ELL supports should include, but are not limited to, the following:: Extended time Provide visual aids Repeated directions Differentiate based on proficiency Provide word banks Allow for translators, dictionaries

Unit Title: Unit 3: Anti-Lock Brake System, Traction Control and Stability

Stage 1: Desired Results

Standards & Indicators:

9.3.12.TD-MTN.1 Develop preventative maintenance plans and systems to keep facility and equipment inventory in operation.

9.3.12.TD-HSE.1 Describe the health, safety and environmental rules and regulations in transportation, distribution and logistics workplaces.

9.3.12.TD-HSE.2 Develop solutions to improve performance of health, safety and environmental management services.

Career Readiness, Life Literacies and Key Skills

Standard	Performance Expectations	Core Ideas
9.4.12.CI.1	Demonstrate the ability to reflect, analyze, and use creative skills and ideas.	With a growth mindset, failure is an important part of success.
9.4.12.CI.3	Investigate new challenges and opportunities for personal growth, advancement, and transition.	Innovative ideas or innovation can lead to career opportunities.
9.4.12.IML.3	Analyze data using tools and models to make valid and reliable claims, or to determine optimal design solutions.	Digital tools such as artificial intelligence, image enhancement and analysis, and sophisticated computer modeling and simulation create new types of information that may have profound effects on society. These new types of information must be evaluated carefully.
9.4.12.IML.4	Assess and critique the appropriateness and impact of existing data visualizations for an intended audience	
9.4.12.TL.4	Collaborate in online learning communities or social networks or virtual worlds to analyze and propose a resolution to a real-world problem.	Collaborative digital tools can be used to access, record and share different viewpoints and to collect and tabulate the views of groups of people.
9.2.12.CAP.3	Investigate how continuing education contributes to one's career and personal growth	There are strategies to improve one's professional value and marketability.
9.2.12.CAP.4	Evaluate different careers and develop various plans (e.g., costs of public, private, training schools) and timetables for achieving them, including educational/training requirements,	Career planning requires purposeful planning based on research, self-knowledge, and informed choices.

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	costs, loans, and debt repayment.	
9.2.12.CAP.6	Identify transferable skills in career choices and design alternative career plans based on those skills.	

Central Idea/Enduring Understanding:	**Essential/Guiding Question:**
Students will understand that… ● All components of an Anti-Lock Brake System must be functional in order for the system to work properly ● Traction control uses ABS sensors in order to communicate with the engine computer	● How does an Anti-Lock Brake System work? ● How does Traction Control work?
Content: ● ABS Diagnostic ● Traction Control Diagnostic ● ABS & TC Components ● ABS Operation ● Traction Control Operation ● Vehicle Stability Operation	**Skills(Objectives):** Students will be able to… ● Identify parts of an Anti-Lock Braking & Traction Control System ● Describe the operation of an Anti-Lock Braking System ● Diagnose problems in an Anti-Lock Braking System ● Describe the operation of a Traction Control and Stability Control System ● Diagnose problems in a Traction Control and Stability Control System ● Repair ABS, TC and Vehicle Stability Systems

Interdisciplinary Connections

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RST.11-12.10 By the end of grade 12, read and comprehend science/technical texts in the grades 11-CCR text complexity band independently and proficiently
CED.A.4 Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. For example, rearrange Ohm's law V = IR to highlight resistance R.

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REI.A.1 Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method.

Stage 2: Assessment Evidence

Performance Task(s):
Chapter/Unit Test
Presentations/Projects
Practical Demonstration
Unit Exams

Other Evidence:
- Do Now
- Concept Map
- Notebook

Stage 3: Learning Plan

Learning Opportunities/Strategies:
- Observation
- Homework
- Class participation
- Writing Assignments
- Do Now
- Notebook
- Hands on Demonstrations

Resources:
- Shop vehicle(s)
- ABS Components (pumps, sensors, trigger wheels)
- Scan Tool
- DVOM
- Brake Fluid
- Brake System Parts (pads, calipers, rotors)
- Automotive Technology textbook Goodheart-Wilcox Publisher, Auto Fundamentals 13th Edition

Differentiation *Please note: Teachers who have students with 504 plans that require curricular accommodations are to refer to Struggling and/or Special Needs Section for differentiation

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Unit Title: **Unit 4: Climate Control Systems**

Stage 1: Desired Results

Standards & Indicators:
9.3.12.TD-MTN.1 Develop preventative maintenance plans and systems to keep facility and equipment inventory in operation.

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9.3.12.TD-HSE.1 Describe the health, safety and environmental rules and regulations in transportation, distribution and logistics workplaces.
9.3.12.TD-HSE.2 Develop solutions to improve performance of health, safety and environmental management services.

Career Readiness, Life Literacies and Key Skills

Standard	Performance Expectations	Core Ideas
9.2.12.CAP.3	Investigate how continuing education contributes to one's career and personal growth	There are strategies to improve one's professional value and marketability.
9.2.12.CAP.4	Evaluate different careers and develop various plans (e.g., costs of public, private, training schools) and timetables for achieving them, including educational/training requirements, costs, loans, and debt repayment.	Career planning requires purposeful planning based on research, self-knowledge, and informed choices.
9.2.12.CAP.6	Identify transferable skills in career choices and design alternative career plans based on those skills.	
9.4.12.IML.3	Analyze data using tools and models to make valid and reliable claims, or to determine optimal design solutions.	Digital tools such as artificial intelligence, image enhancement and analysis, and sophisticated computer modeling and simulation create new types of information that may have profound effects on society. These new types of information must be evaluated carefully.
9.4.12.IML.4	Assess and critique the appropriateness and impact of existing data visualizations for an intended audience	
9.4.12.TL.4	Collaborate in online learning communities or social networks or virtual worlds to analyze and propose a resolution to a real-world problem.	Collaborative digital tools can be used to access, record and share different viewpoints and to collect and tabulate the views of groups of people.

Central Idea/Enduring Understanding:
Students will understand that…
- Heating and AC systems are specialized systems and should be repaired by qualified technicians.

Essential/Guiding Question:
- How does air conditioning work?
- How does heat and ventilation work?

Content:
- Heat transfer
- Heat movement
- Vaporization & evaporation
- Condensation
- Temperature
- Pressure
- Refrigerant types
- Refrigerant oil
- AC components
- HVAC controls

Skills(Objectives):
Students will be able to…
- Explain how refrigeration works
- Describe the low and high-pressure sides of an AC system
- Summarize how heating, ventilation and AC systems operate
- Describe safety hazards when working with heating and AC systems

Interdisciplinary Connections
NJSLSA.R7: Integrate and evaluate content presented in diverse media and formats, including visually and quantitatively, as well as in words.
RST.9-10.7: Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.
WHST.9-12.1: Write arguments focused on discipline-specific content.

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HS-ETS1-3: Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts.
8.1.12.DA.1: Create interactive data visualizations using software tools to help others better understand real world phenomena, including climate change.
8.1.12.DA.6: Create and refine computational models to better represent the relationships among different elements of data collected from a phenomenon or process.
8.1.12.AP.5: Decompose problems into smaller components through systematic analysis, using constructs such as procedures, modules, and/or objects.
8.2.2.EC.1: Identify and compare technology used in different schools, communities, regions, and parts of the world.
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RL.9-10.2 Determine a theme or central idea of a text and analyze in detail its development over the course of the text, including how it emerges and is shaped and refined by specific details and provide an objective summary of the text.
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RST.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 11-12 texts and topics.
RST.11-12.10 By the end of grade 12, read and comprehend science/technical texts in the grades 11-CCR text complexity band independently and proficiently
CED.A.4 Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. For example, rearrange Ohm's law V = IR to highlight resistance R.
REI.A.1 Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method.

Stage 2: Assessment Evidence

Performance Task(s):	Other Evidence:
Chapter/Unit Test Presentations/Projects Practical Demonstration Unit Exams	• Do Now • Concept Map • Notebook

Stage 3: Learning Plan

Learning Opportunities/Strategies:	Resources:
• Observation • Homework • Class participation • Writing Assignments • Do Now • Notebook • Hands on Demonstrations	• Shop vehicles • Shop tools • Automotive Technology textbook Goodheart-Wilcox Publisher, Auto Fundamentals 13th Edition • Printed Circuit Boards • Wires and Test Leads • Shop Tools • Electrical Components • Shop Vehicle(s)

Differentiation *Please note: Teachers who have students with 504 plans that require curricular accommodations are to refer to Struggling and/or Special Needs Section for differentiation

High-Achieving Students	On Grade Level Students	Struggling Students	Special Needs/ELL
Teacher tutoring Peer tutoring Cooperative learning groups	Teacher tutoring Peer tutoring	Teacher tutoring Peer tutoring Cooperative learning	Any student requiring further accommodations and/or modifications will have them individually listed in

Differentiated instruction Extra credit assignments for faster paced students	Cooperative learning groups Differentiated instruction Pair students with a partner if needed	groups Differentiated instruction Response to Intervention (RTI) www.help4teachers.com (search tiered lesson plan template) Pair students with a partner if needed Pacing deadlines for slower paced students	their 504 Plan or IEP. These might include, but are not limited to: breaking assignments into smaller tasks, giving directions through several channels (auditory, visual, kinesthetic, model), and/or small group instruction for reading/writing ELL supports should include, but are not limited to, the following:: Extended time Provide visual aids Repeated directions Differentiate based on proficiency Provide word banks Allow for translators, dictionaries

Unit Title: **Unit 5: Engine Performance**

Stage 1: Desired Results

Standards & Indicators:

9.3.12.TD-MTN.1 Develop preventative maintenance plans and systems to keep facility and equipment inventory in operation.

9.3.12.TD-HSE.1 Describe the health, safety and environmental rules and regulations in transportation, distribution and logistics workplaces.

9.3.12.TD-HSE.2 Develop solutions to improve performance of health, safety and environmental management services.

Career Readiness, Life Literacies and Key Skills

Standard	Performance Expectations	Core Ideas
9.2.12.CAP.3	Investigate how continuing education contributes to one's career and personal growth	There are strategies to improve one's professional value and marketability.
9.2.12.CAP.4	Evaluate different careers and develop various plans (e.g., costs of public, private, training schools) and timetables for achieving them, including educational/training requirements, costs, loans, and debt repayment.	Career planning requires purposeful planning based on research, self-knowledge, and informed choices.
9.2.12.CAP.6	Identify transferable skills in career choices and design alternative career plans based on those skills.	
9.4.12.IML.3	Analyze data using tools and models to make valid and reliable claims, or to determine optimal design solutions.	Digital tools such as artificial intelligence, image enhancement and analysis, and sophisticated computer modeling and simulation create new types of information that may have profound effects on society. These new types of information must be evaluated carefully.
9.4.12.IML.4	Assess and critique the appropriateness and impact of existing data visualizations for an intended audience	
9.4.12.TL.4	Collaborate in online learning communities or social networks or virtual worlds to analyze and	Collaborative digital tools can be used to access, record and share different

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	propose a resolution to a real-world problem.	viewpoints and to collect and tabulate the views of groups of people.

Central Idea/Enduring Understanding:	**Essential/Guiding Question:**
Students will understand that… ● Increasing power typically adds additional stress to engine components ● Engine life is typically shorter on high performance engines	● What is needed to make more horsepower? ● How much power is too much power?
Content: ● MAF and Speed Density Systems ● Exhaust flow ● Turbochargers ● Centrifugal & Rootes Superchargers ● Nitrous Oxide properties	**Skills(Objectives):** Students will be able to… ● Describe the intake and exhaust systems of a vehicle ● Explain how turbochargers work ● Explain how superchargers work ● Explain how nitrous oxide works ● Repair exhaust system components

Interdisciplinary Connections

NJSLSA.R7: Integrate and evaluate content presented in diverse media and formats, including visually and quantitatively, as well as in words.
RST.9-10.7: Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.
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HS-ETS1-3: Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts.
8.1.12.DA.1: Create interactive data visualizations using software tools to help others better understand real world phenomena, including climate change.
8.1.12.DA.6: Create and refine computational models to better represent the relationships among different elements of data collected from a phenomenon or process.
8.1.12.AP.5: Decompose problems into smaller components through systematic analysis, using constructs such as procedures, modules, and/or objects.
8.2.2.EC.1: Identify and compare technology used in different schools, communities, regions, and parts of the world.
RL.11-12.1 Cite strong and thorough textual evidence and make relevant connections to support analysis of what the text says explicitly as well as inferences drawn from the text, including determining where the text leaves matters uncertain.
RL.9-10.2 Determine a theme or central idea of a text and analyze in detail its development over the course of the text, including how it emerges and is shaped and refined by specific details and provide an objective summary of the text.
RST.11-12.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.
RST.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 11-12 texts and topics.
RST.11-12.10 By the end of grade 12, read and comprehend science/technical texts in the grades 11-CCR text complexity band independently and proficiently
CED.A.4 Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. For example, rearrange Ohm's law V = IR to highlight resistance R.
REI.A.1 Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method.

Stage 2: Assessment Evidence

Performance Task(s):	**Other Evidence:**
Chapter/Unit Test Presentations/Projects	● Do Now ● Concept Map

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Practical Demonstration Unit Exams	• Notebook

Stage 3: Learning Plan

Learning Opportunities/Strategies:	**Resources:**
• Observation • Homework • Class participation • Writing Assignments • Do Now • Notebook • Hands on Demonstrations	• Shop vehicle(s) • Scan tool • Turbocharger • Mufflers • Camshafts • Intake Manifolds

Differentiation *Please note: Teachers who have students with 504 plans that require curricular accommodations are to refer to Struggling and/or Special Needs Section for differentiation

High-Achieving Students	On Grade Level Students	Struggling Students	Special Needs/ELL
Teacher tutoring Peer tutoring Cooperative learning groups Differentiated instruction Extra credit assignments for faster paced students	Teacher tutoring Peer tutoring Cooperative learning groups Differentiated instruction Pair students with a partner if needed	Teacher tutoring Peer tutoring Cooperative learning groups Differentiated instruction Response to Intervention (RTI) www.help4teachers.com (search tiered lesson plan template) Pair students with a partner if needed Pacing deadlines for slower paced students	Any student requiring further accommodations and/or modifications will have them individually listed in their 504 Plan or IEP. These might include, but are not limited to: breaking assignments into smaller tasks, giving directions through several channels (auditory, visual, kinesthetic, model), and/or small group instruction for reading/writing ELL supports should include, but are not limited to, the following:: Extended time Provide visual aids Repeated directions Differentiate based on proficiency Provide word banks Allow for translators, dictionaries

Unit Title: **Unit 6: Hybrid and Alternative Fuel Vehicles**

Stage 1: Desired Results

Standards & Indicators:

9.3.12.TD-MTN.1 Develop preventative maintenance plans and systems to keep facility and equipment inventory in operation.

9.3.12.TD-HSE.1 Describe the health, safety and environmental rules and regulations in transportation, distribution and logistics workplaces.

9.3.12.TD-HSE.2 Develop solutions to improve performance of health, safety and environmental management services.

Career Readiness, Life Literacies and Key Skills

Standard	Performance Expectations	Core Ideas
9.4.12.CI.1	Demonstrate the ability to reflect, analyze, and use creative skills and ideas.	With a growth mindset, failure is an important part of success.

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9.4.12.CI.3	Investigate new challenges and opportunities for personal growth, advancement, and transition.	Innovative ideas or innovation can lead to career opportunities.
9.4.12.IML.3	Analyze data using tools and models to make valid and reliable claims, or to determine optimal design solutions.	Digital tools such as artificial intelligence, image enhancement and analysis, and sophisticated computer modeling and simulation create new types of information that may have profound effects on society. These new types of information must be evaluated carefully.
9.4.12.IML.4	Assess and critique the appropriateness and impact of existing data visualizations for an intended audience	
9.4.12.TL.4	Collaborate in online learning communities or social networks or virtual worlds to analyze and propose a resolution to a real-world problem.	Collaborative digital tools can be used to access, record and share different viewpoints and to collect and tabulate the views of groups of people.
9.2.12.CAP.3	Investigate how continuing education contributes to one's career and personal growth	There are strategies to improve one's professional value and marketability.
9.2.12.CAP.4	Evaluate different careers and develop various plans (e.g., costs of public, private, training schools) and timetables for achieving them, including educational/training requirements, costs, loans, and debt repayment.	Career planning requires purposeful planning based on research, self-knowledge, and informed choices.
9.2.12.CAP.6	Identify transferable skills in career choices and design alternative career plans based on those skills.	

Central Idea/Enduring Understanding:
Students will understand that…
- Hybrid vehicles contain many high voltage batteries and can cause serious harm or death if you are not trained to work on these vehicles

Essential/Guiding Question:
- What makes a vehicle a hybrid?
- What are alternative fuels?

Content:
- Hybrid vehicle history and development
- Hybrid vehicle components
- Hybrid vehicle operation
- Hybrid vehicle maintenance
- Hybrid vehicle hazards
- Alternative fuels
- Alternative fuel vehicle components
- Alternative fuel vehicle maintenance
- Alternative fuel vehicle hazards

Skills(Objectives):
Students will be able to…
- Describe how a hybrid vehicle operates
- Identify the components of a hybrid vehicle
- Explain the hazards associated with a hybrid vehicle
- Describe what an alternative fuel is
- Explain how an alternative fuel vehicle operates
- Identify the components of an alternative fuel vehicle
- Do basic maintenance and repairs on hybrid and alternative fuel vehicles

Interdisciplinary Connections
NJSLSA.R7: Integrate and evaluate content presented in diverse media and formats, including visually and quantitatively, as well as in words.
RST.9-10.7: Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.
WHST.9-12.1: Write arguments focused on discipline-specific content.
HS-ETS1-3: Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts.
8.1.12.DA.1: Create interactive data visualizations using software tools to help others better understand real world phenomena, including climate change.

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Stage 2: Assessment Evidence

Performance Task(s):	Other Evidence:
Chapter/Unit Test Presentations/Projects Practical Demonstration Unit Exams	• Do Now • Concept Map • Notebook

Stage 3: Learning Plan

Learning Opportunities/Strategies:	Resources:
• Observation • Homework • Class participation • Writing Assignments • Do Now • Notebook • Hands on Demonstrations	• Hybrid vehicle • Online resources • https://www.fueleconomy.gov/ • Automotive Technology textbooks, Goodheart-Wilcox Publisher, Auto Fundamentals 13th Edition

Differentiation *Please note: Teachers who have students with 504 plans that require curricular accommodations are to refer to Struggling and/or Special Needs Section for differentiation

High-Achieving Students	On Grade Level Students	Struggling Students	Special Needs/ELL
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		partner if needed Pacing deadlines for slower paced students	ELL supports should include, but are not limited to, the following:: Extended time Provide visual aids Repeated directions Differentiate based on proficiency Provide word banks Allow for translators, dictionaries

Pacing Guide

Course Name	Resource	Standards
MP 1		
UNIT 1 **Shop and Machine Safety Review** 5 Days	• Shop Safety Equipment • Fire Extinguisher Information Sheet • Fire Evacuation Review • Shop Tools • Automotive Technology textbook Goodheart-Wilcox Publisher, Auto Fundamentals 13th Edition	**9.3.12.TD-MTN.1** Develop preventative maintenance plans and systems to keep facility and equipment inventory in operation. **9.3.12.TD-HSE.1** Describe the health, safety and environmental rules and regulations in transportation, distribution and logistics workplaces. **9.3.12.TD-HSE.2** Develop solutions to improve performance of health, safety and environmental management services.
MP 1		
UNIT 2 **Electronics and Electrical Systems** 15 Days	• DVOM • Printed Circuit Boards • Wires and Test Leads • Shop Tools • Electrical Components • Shop vehicle(s) • Automotive Technology textbook Goodheart-Wilcox Publisher, Auto Fundamentals 13th Edition	**9.3.12.TD-MTN.1** Develop preventative maintenance plans and systems to keep facility and equipment inventory in operation. **9.3.12.TD-HSE.1** Describe the health, safety and environmental rules and regulations in transportation, distribution and logistics workplaces. **9.3.12.TD-HSE.2** Develop solutions to improve performance of health, safety and environmental management services.
MP 1		
UNIT 3 **Anti-Lock Brake System, Traction Control and Stability** 20 Days	• Shop vehicle(s) • ABS Components (pumps, sensors, trigger wheels) • Scan Tool • DVOM • Brake Fluid • Brake System Parts (pads, calipers, rotors)	**9.3.12.TD-MTN.1** Develop preventative maintenance plans and systems to keep facility and equipment inventory in operation. **9.3.12.TD-HSE.1** Describe the health, safety and environmental rules and regulations in transportation, distribution and logistics workplaces.

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	• Automotive Technology textbook Goodheart-Wilcox Publisher, Auto Fundamentals 13th Edition	**9.3.12.TD-HSE.2** Develop solutions to improve performance of health, safety and environmental management services.
MP 1/2		
UNIT 4 **Climate Control Systems** 5 Days (MP 1) 15 Days (MP 2)	• Shop vehicles • Shop tools • Automotive Technology textbook Goodheart-Wilcox Publisher, Auto Fundamentals 13th Edition • Printed Circuit Boards • Wires and Test Leads • Shop Tools • Electrical Components • Shop Vehicle(s)	**9.3.12.TD-MTN.1** Develop preventative maintenance plans and systems to keep facility and equipment inventory in operation. **9.3.12.TD-HSE.1** Describe the health, safety and environmental rules and regulations in transportation, distribution and logistics workplaces. **9.3.12.TD-HSE.2** Develop solutions to improve performance of health, safety and environmental management services.
MP 2		
UNIT 5 **Engine Performance** 15 Days	• Shop vehicle(s) • Scan tool • Turbocharger • Mufflers • Camshafts • Intake Manifolds	**9.3.12.TD-MTN.1** Develop preventative maintenance plans and systems to keep facility and equipment inventory in operation. **9.3.12.TD-HSE.1** Describe the health, safety and environmental rules and regulations in transportation, distribution and logistics workplaces. **9.3.12.TD-HSE.2** Develop solutions to improve performance of health, safety and environmental management services.
MP 2		
UNIT 6 **Hybrid and Alternative Fuel Vehicles** 15 Days	• Hybrid vehicle • Online resources • https://www.fueleconomy.gov/ • Automotive Technology textbooks, Goodheart-Wilcox Publisher, Auto Fundamentals 13th Edition	**9.3.12.TD-MTN.1** Develop preventative maintenance plans and systems to keep facility and equipment inventory in operation. **9.3.12.TD-HSE.1** Describe the health, safety and environmental rules and regulations in transportation, distribution and logistics workplaces. **9.3.12.TD-HSE.2** Develop solutions to improve performance of health, safety and environmental management services.